STANDARD HAZARD MITIGATION PLAN

FOR

THE GREAT STATE OF OKLAHOMA

JANUARY 23, 2019

Contents

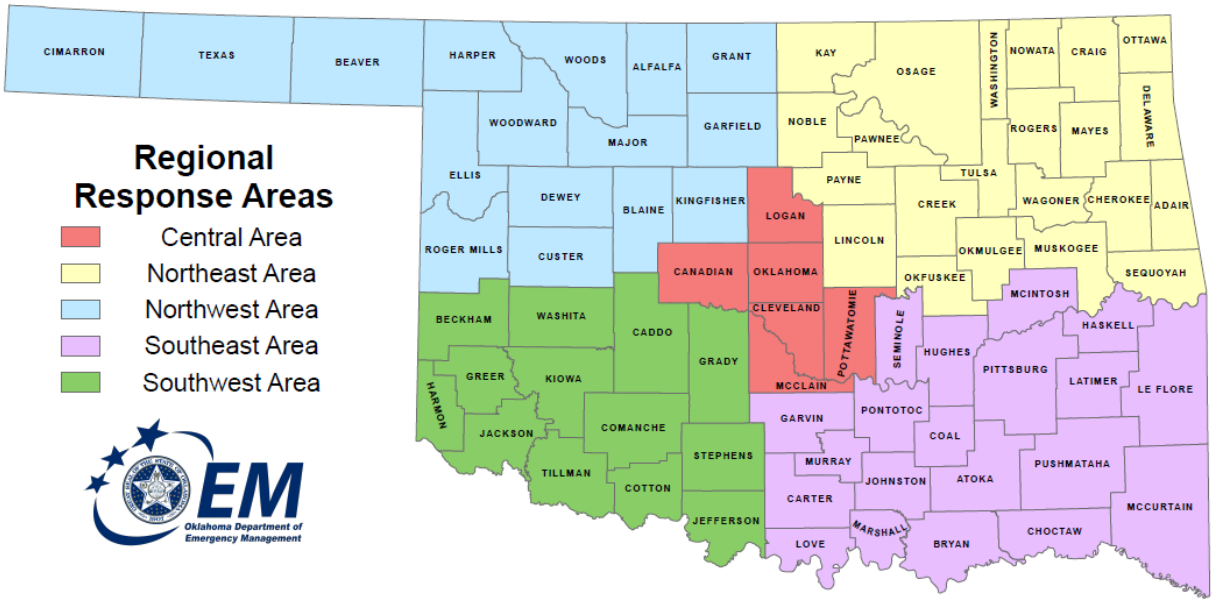
CHAPTER ONE: INTRODUCTION

1.1 Plan Purpose and Scope

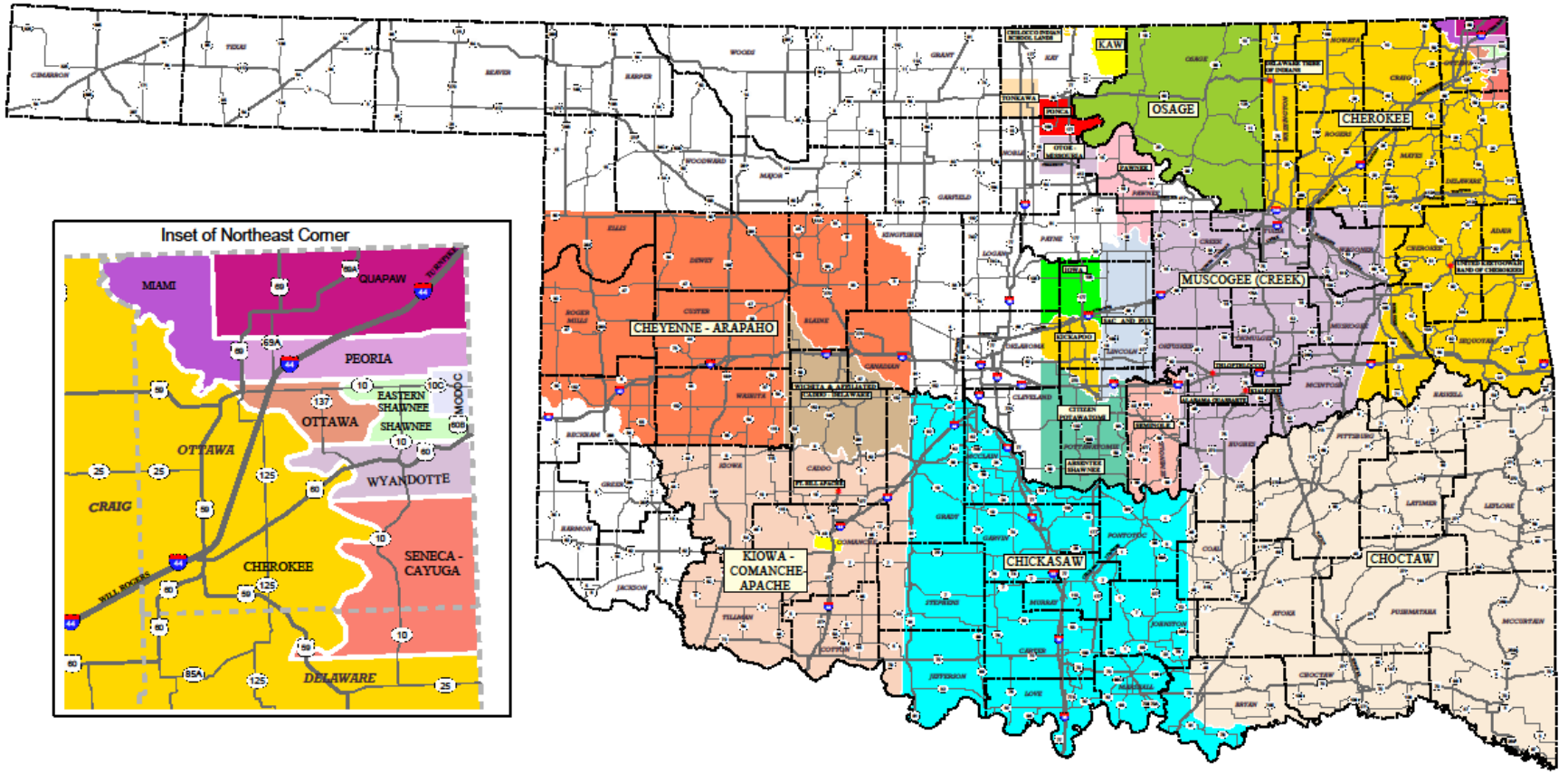
The National Preparedness Goal of the Federal Emergency Management Agency (FEMA) consists of five mission areas; Prevention, Protection, Mitigation, Response, and Recovery. The first core capability of Mitigation is Planning. This document is the 2019 Standard Hazard Mitigation Plan for the Great State of Oklahoma, and will be referred to as "the State Plan." The purpose of the State Plan is to reduce the risks from natural hazards and to assist decision makers as they allocate resources towards reducing the effects of natural hazards. In addition, the State Plan fulfills the Federal requirement for Oklahoma to be eligible to receive the following FEMA assistance:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Fire Mitigation Assistance Grants-Post Fire Mitigation (FMAG-PF)
- Public Assistance Category C-G

The scope of this plan is statewide, encompassing seventy-seven counties and thirty-eight Federal and State Recognized Tribal Nations.



TRIBAL JURISDICTIONS IN OKLAHOMA



38 FEDERALLY RECOGNIZED TRIBES (Tribal Boundaries provided by the Bureau of Land Management)

ABSENTEE SHAWNEE TRIBE	CHOCTAW NATION	IOWA TRIBE	MUSCOGEE (CREEK) NATION	QUAPAW TRIBE	UNITED KEETOOWAH BAND OF CHEROKEE
ALABAMA QUASSARTE TRIBAL TOWN	CITIZEN POTAWATOMI TRIBE	KAW NATION	OSAGE NATION	SAC AND FOX NATION	WICHITA & AFFILIATED TRIBE
APACHE TRIBE	COMANCHE NATION	KIALEGEE TRIBAL TOWN	OTOE - MISSOURIA TRIBE	SEMINOLE NATION	WYANDOTTE NATION
CADDO TRIBE	DELAWARE NATION	KICKAPOO TRIBE	OTTAWA TRIBE	SENECA - CAYUGA TRIBE	
CHEROKEE NATION	DELAWARE TRIBE OF INDIANS	KIOWA TRIBE	PAWNEE NATION	SHAWNEE TRIBE	
CHEYENNE - ARAPAHO TRIBES	EASTERN SHAWNEE TRIBE	MIAMI NATION	PEORIA TRIBE	THLOPTHLOCCO TRIBAL TOWN	
CHICKASAW NATION	FT. SILL APACHE	MODOC TRIBE	PONCA NATION	TONKAWA TRIBE	

2010

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1.2 Planning Area Climate, Population, Economy

1.2.1 Climate

Overview

The Ouachita Mountains dominate southeast Oklahoma, with peaks rising as much as 2,000 feet above their base. Extreme east-central Oklahoma features the mountains of the Arkansas River Valley, rising several hundred feet above the plains. Extreme northeastern counties are part of the Ozark Plateau, marked by steep, rocky river valleys between large areas of hills and rolling plains. The western tip of the panhandle is part of the fractured terrain of the Black Mesa complex.

Oklahoma lies entirely within the drainage basin of the Mississippi River. The two main rivers in the state are the Arkansas River, draining the northern two-thirds of the state, and the Red River, which drains the southern third and is the state's southern border. Principal tributaries of the Arkansas are the Verdigris, Grand (Neosho), Illinois, Cimarron, Canadian and North Canadian. The Washita and Kiamichi are the Red's principal tributaries in Oklahoma, and the Little River flows into the Red after it crosses into Arkansas.

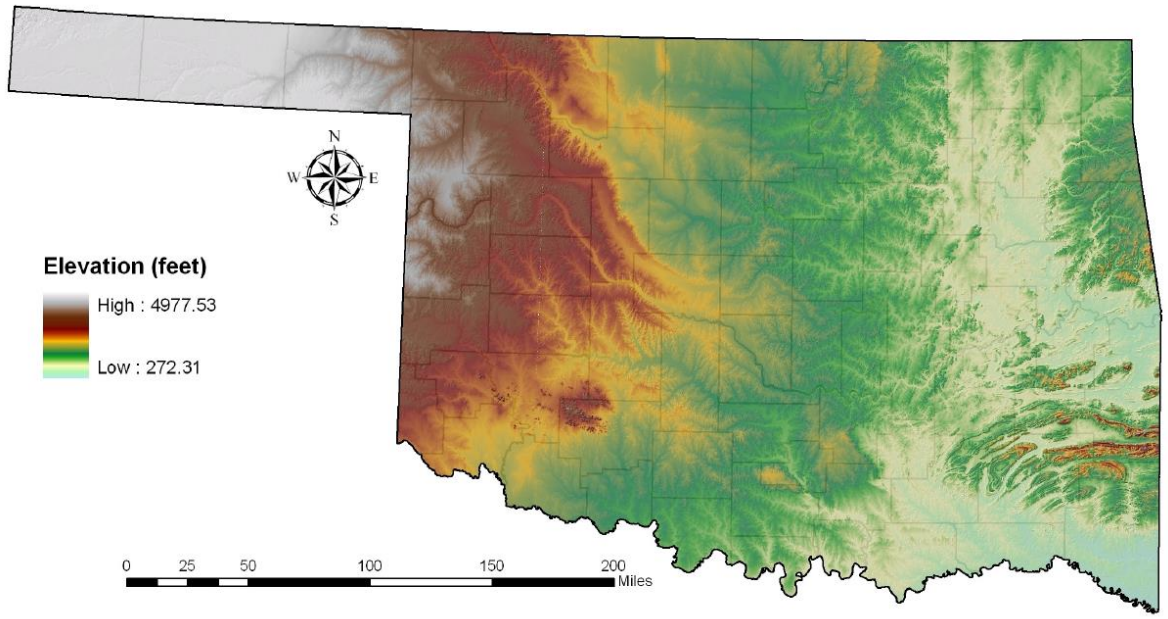


Figure 1: Elevation (in feet) above mean sea level across Oklahoma.

According to the Koppen climate classification, Oklahoma's climate ranges from humid subtropical in the east to semi-arid in the west. Warm, moist air moving northward from the Gulf of Mexico often exerts much influence, particularly over the southern and eastern portions of the state, where humidity, cloudiness and precipitation are resultantly greater than in western and northern sections. Summers are long and usually quite hot. Winters are shorter and less severe

than those of the more northern Plains states. Periods of extreme cold are infrequent, and those lasting more than a few days are rare.

Our knowledge of climate is based on the variables that we measure, typically with surface observing stations, weather radar, satellites, weather balloons, and other instrumentation. Some weather events cannot be measured easily by automated methods (e.g., tornadoes) and must be documented by human observers. Hence, as Oklahoma's population increased over the years, human observations of rare events became more prevalent. Even measurements of mundane variables such as temperature have become more common, with automated weather stations taking more measurements per day at more locations than in past decades. The following sections highlight some of these variables and associated events.

Temperature

The mean annual temperature over the state ranges from 62 ° F along the Red River to about 58 ° F along the northern border (Figure 2). It then decreases westward to 56 ° F in Cimarron County.

Temperatures of 90 ° F or greater occur, on average, about 60-65 days per year in the western panhandle and the northeast corner of the state. The average is about 115 days in southwest Oklahoma and about 85 days in the southeast. Temperatures of 100 ° F or higher occur, frequently during some years, from May through September, and very rarely in April and October. With 30-40 days at or above 100 ° F, western Oklahoma experiences more extreme summer temperatures than elsewhere in the state. Both the Panhandle and eastern Oklahoma average about 15 days above the century mark. The increased humidity in the east, however, adds to that section of the state's summertime misery.

Heat index values of 105 ° or greater occur more than 40 times per year in the far southeast and less than 10 times per year in the far northwest. Years without 100 ° F temperatures are rare, ranging from about one of every seven years in the eastern half of the state to somewhat rarer in the west.

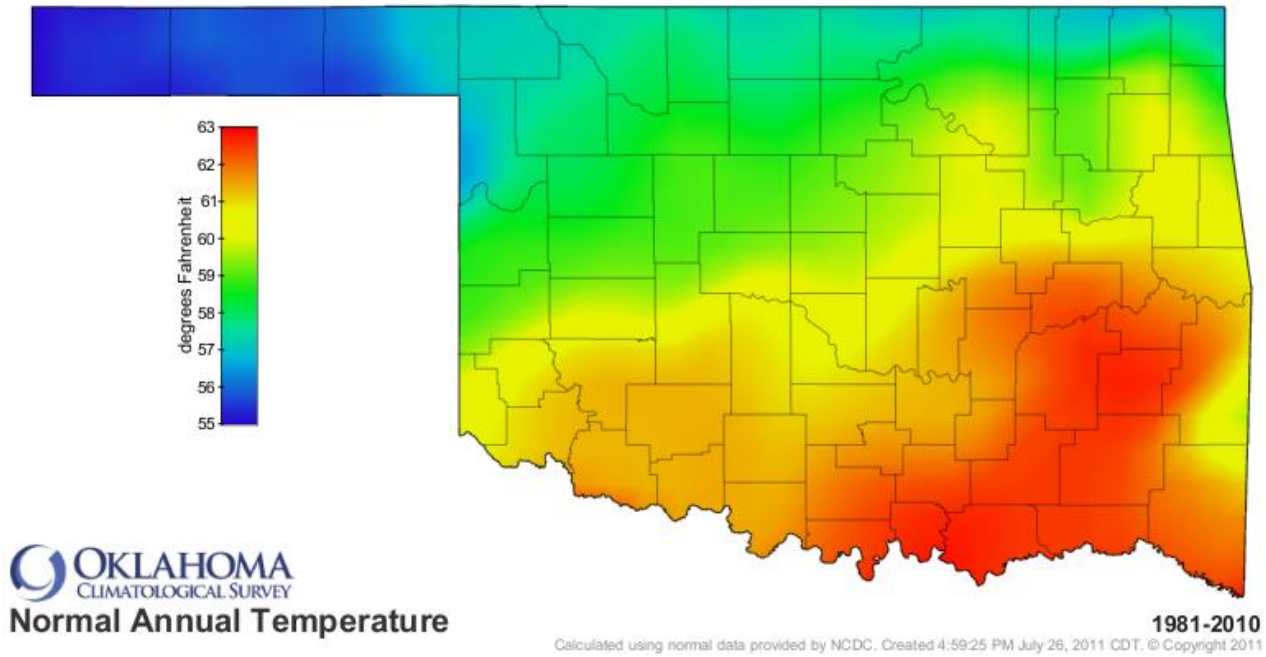


Figure 2: Map of the normal annual temperature (in degrees Fahrenheit) for Oklahoma using data from 1981 to 2000.

The highest temperature ever recorded in the state was 120°F. This reading was first observed during the brutally hot summer of 1936: at Alva on July 18, at Altus on both July 19 and August 12, and at Poteau on August 10. In addition, Tishomingo observed 120°F on July 26, 1943.

Temperatures of 32°F or less occur an average of 60 days per year in the southeast. This value increases to about 110 days per year where the panhandle joins the rest of the state, and to 140 days in the western panhandle. The lowest temperature on record is -31°F, set at Nowata on February 10, 2011.

The average length of the growing season (Figure 3), or freeze-free period, is at a maximum of 225 to 230 days in the southern tier of counties and in the Arkansas River Valley downstream of Tulsa. The value generally decreases to about 195 days in the eastern panhandle, then more rapidly to 175 days in the western panhandle. The general northwest-to-southeast gradient is interrupted in the Ouachita Mountains, where growing seasons are three to four weeks shorter compared to surrounding areas.

Along the Red River, the average date of the last freeze of spring ranges from about March 15 in the east to April 1 in the west. In northern Oklahoma, the last freeze of spring occurs, on average, from about April 8 near the Missouri border to April 15 in the eastern panhandle to the last week of April in the western panhandle. Freezing temperatures have occurred as late as April 20 along

the southern border and in east-central Oklahoma to about May 15 in northwest Oklahoma to the last days of May in the western panhandle.

The average date of the autumn's first freeze varies from about October 15 in the western panhandle, to about October 25 along the northern border and in northwestern Oklahoma, to about November 10 along the Red River and in the Arkansas River Valley downstream of Tulsa. Autumn freezes have occurred as early as about September 15 in the western third of the state to about October 15 in the southeast corner. Again, the Ouachita Mountains tend to differ from surrounding terrain by about two weeks during either season.

Frozen soil is not a major problem, nor much of a deterrent to seasonal activities. Its occurrence is rather infrequent, of very limited depth, and of brief duration.

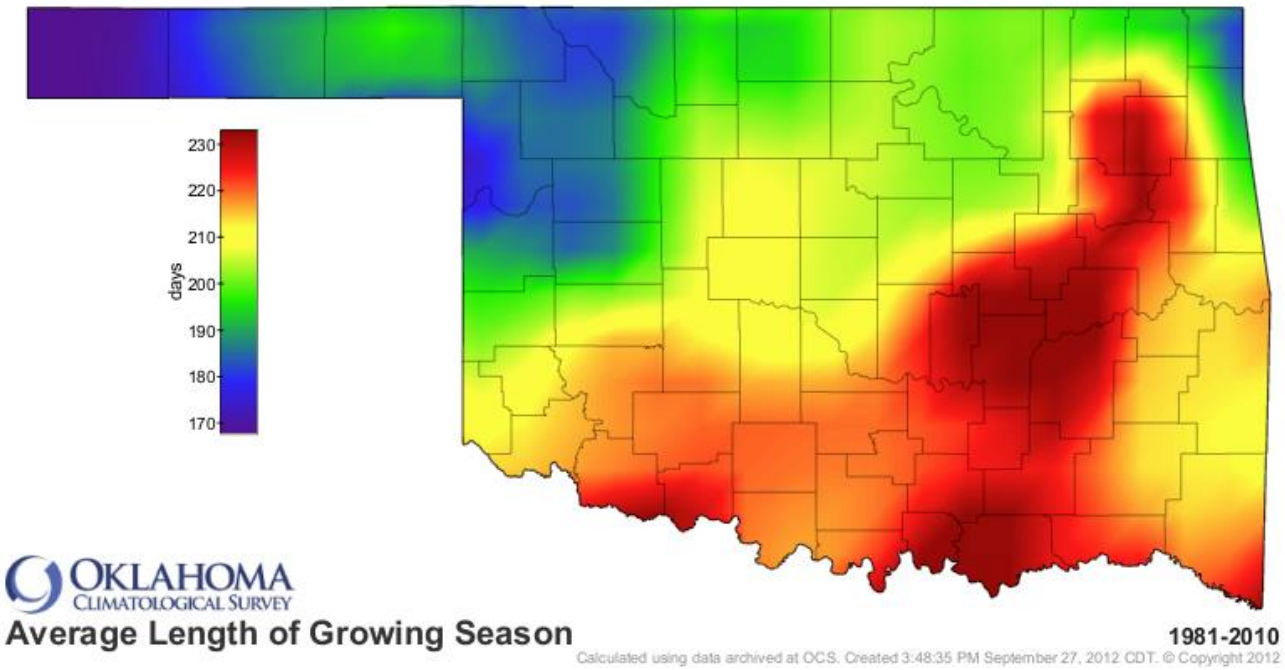


Figure 3: Map of the average length (in days) of the growing season using data from 1981 to 2010.

Precipitation

The dominant feature of the spatial distribution of rainfall across Oklahoma is a sharp decrease in rainfall from east to west (Figure 4). Although precipitation is quite variable on a year-to-year basis (Figure 5), average annual precipitation ranges from about 17 inches in the far western panhandle to about 56 inches in the far southeast. Only the summer months of July and August see a substantial relaxation of this distribution. The greatest annual precipitation recorded at an official reporting station was 84.47 inches at Kiamichi Tower in the southeast in 1957. The least annual rainfall occurred during 1956, when Regnier, in the extreme northwestern panhandle,

observed 6.53 inches.

The frequency of days with measurable precipitation follows the same gradient as the annual accumulation, increasing from 45 days per year in western Oklahoma to 115 near the Arkansas border. On average, more precipitation falls during the nighttime hours, while greatest rainfall intensities occur during late afternoon. Excessive rainfall occurs at times. Amounts of 10 inches or more during 24 hours, while rare, have been recorded. The greatest official rainfall in a 24-hour period is 15.68 inches at Enid on October 11, 1973.

The character of precipitation also varies by season. Wintertime precipitation tends to be somewhat widespread, stratiform in nature, and tied almost exclusively to synoptic-scale systems. Rainfall is the dominant precipitation type during winter for all but the Oklahoma panhandle. Summertime precipitation is almost entirely convective in nature, produced by individual thunderstorms and thunderstorm complexes. The transition seasons of spring and autumn offer both convective and stratiform precipitation. A significant portion of the state's precipitation during the transition seasons is associated with systems of severe thunderstorms.

Average annual snowfall (Figure 6) increases from less than two inches in the extreme southeast to nearly 30 inches in the western panhandle. The frequency of snow events also increases sharply along the same gradient. Locations in southeast Oklahoma have gone several years between events, while northwestern Oklahoma typically records several snow events in one winter.

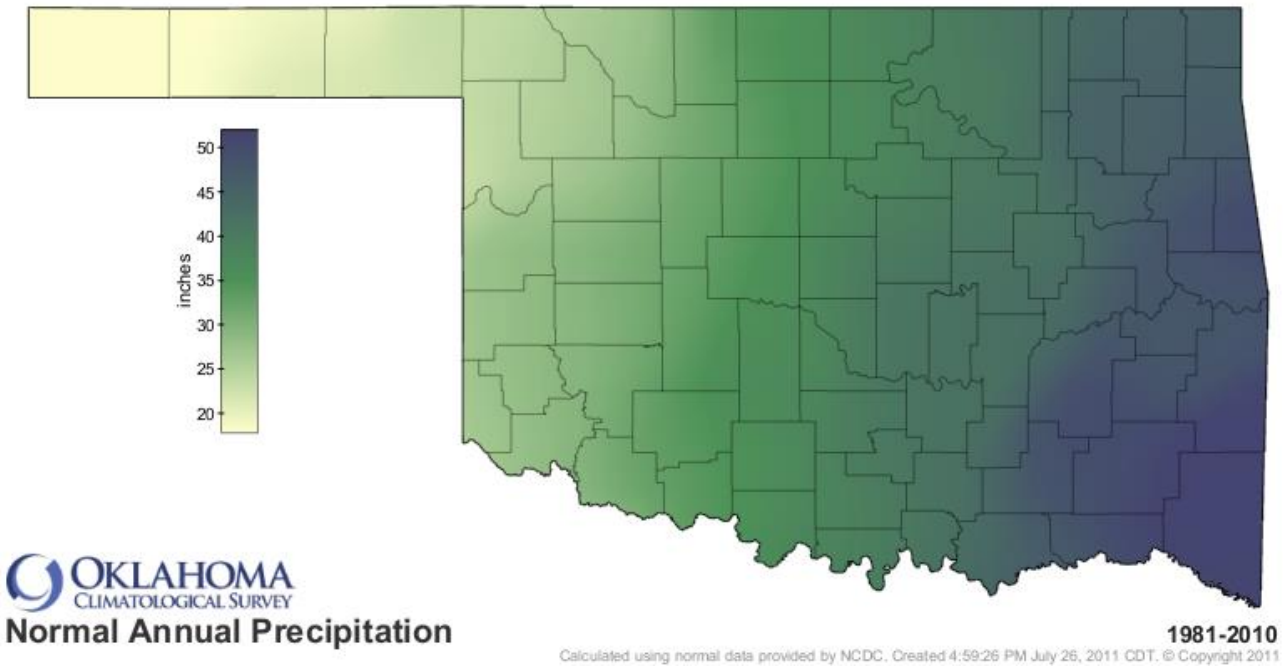


Figure 4: Map of the normal annual precipitation (in inches) for Oklahoma using data from 1981 to 2010.

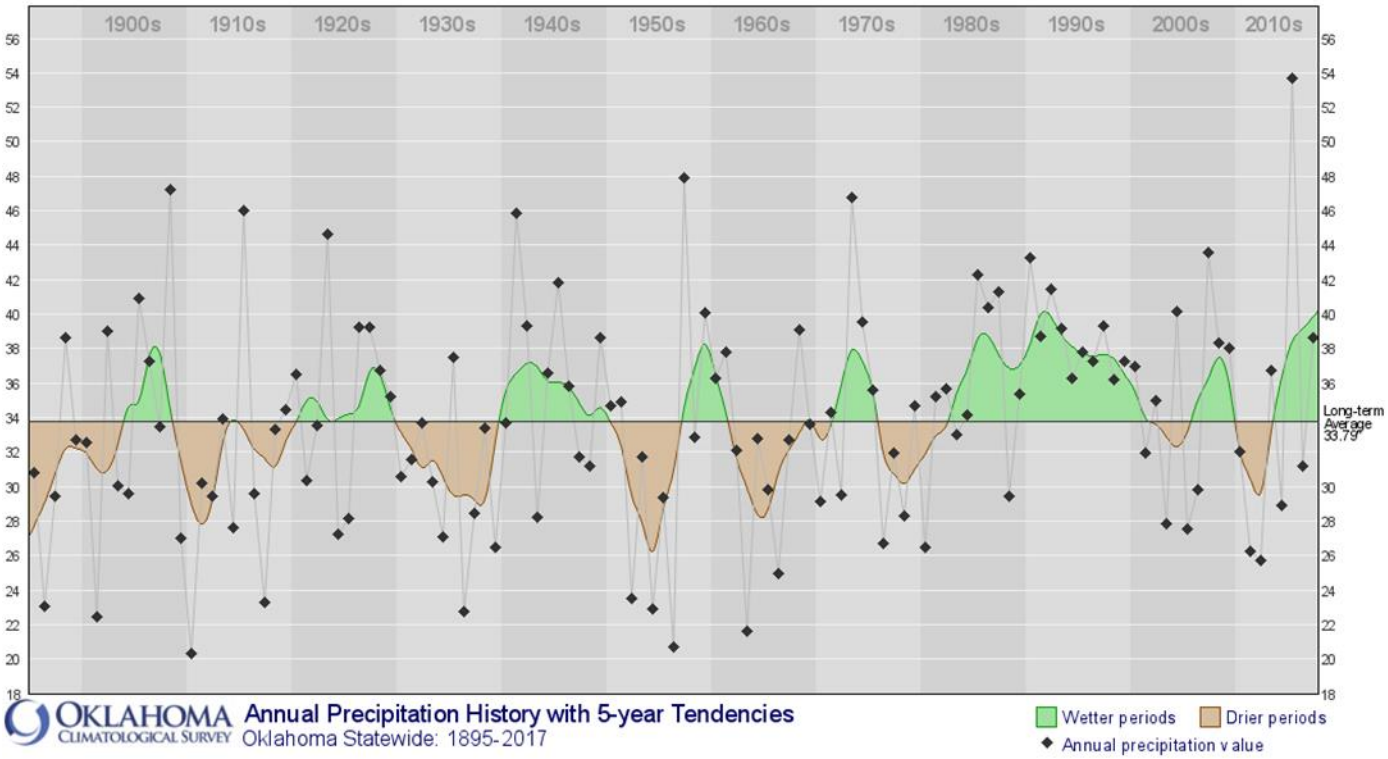


Figure 5: Graph of the statewide average annual precipitation (in inches) for Oklahoma using data from 1895 to 2009. Green shading (above the horizontal line) highlights wetter periods and brown shading (below the line) highlights drier periods than average.

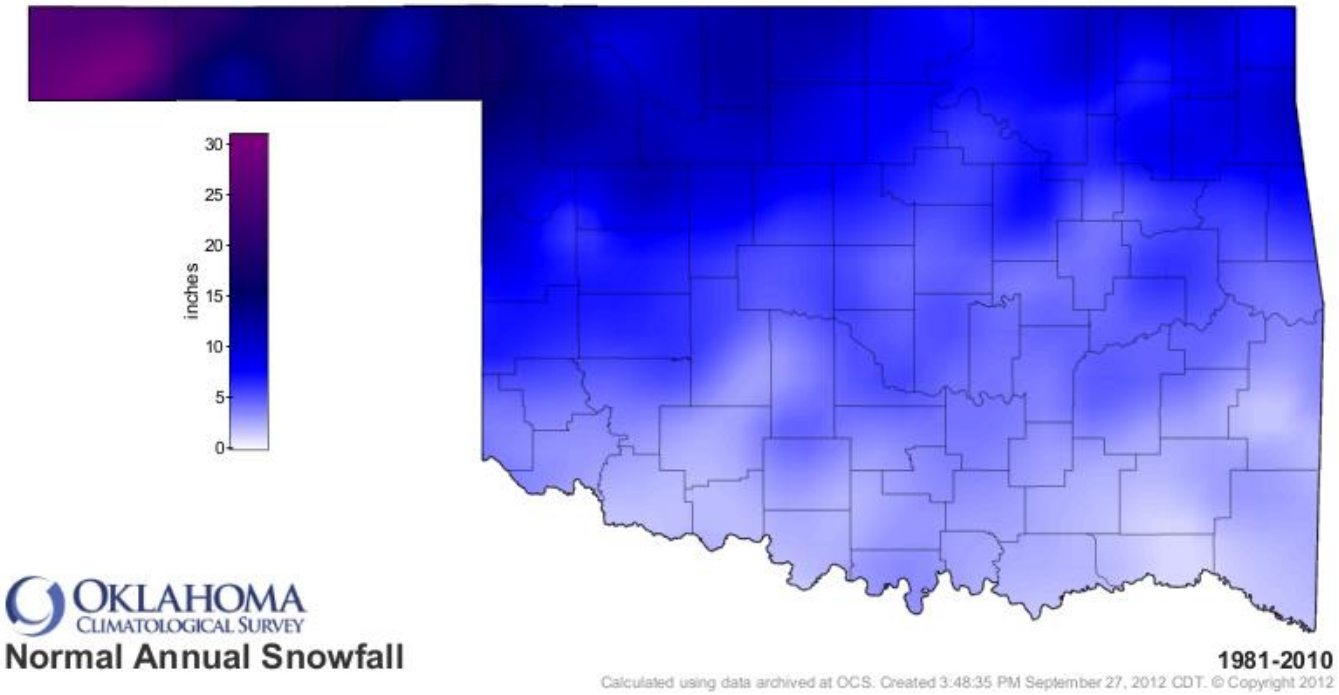


Figure 6: Map of the normal annual snowfall (in inches) for Oklahoma using data from 1981 to 2010.

Floods

Floods of major rivers and tributaries may happen during any season, but they occur with greatest frequency during those spring and autumn months associated with greatest rainfall. Such floods cost many lives and property damage during the first 50 years of statehood, but flood prevention programs have reduced the frequency and severity of such events. Flash flooding of creeks and minor streams remains a serious threat, especially in urban and suburban areas, where development and removal of vegetation have increased runoff.

Drought

Drought is a recurring part of Oklahoma's climate cycle, as it is in all the Plains states. Almost all of Oklahoma's usable surface water comes from precipitation that falls within the state's borders. Therefore, drought in Oklahoma is tied almost entirely to local rainfall patterns (i.e., the influence of upstream events on drought is very small). Western Oklahoma is slightly more susceptible to drought because precipitation there tends to be more variable (percentage-wise) and marginal for dryland farm applications.

Drought episodes can last from a few months to several years. Those that last a few months can elevate wildfire danger and impact municipal water use. Seasonal droughts can occur at any time of the year, and those that coincide with crop production cycles can cause billions of dollars of damage to the farm economy. Multi-season and multi-year episodes can severely impact large

reservoirs, streamflow and groundwater.

Since modern climatological record-keeping began in the 1890s, the state has seen five major multi-year, regional drought events. These occurred in the late 1890s, from 1909-18, 1930-40, 1952-58 and, to a lesser extent, 1962-72 (Figure 5). Each of these episodes contained at least one year of above-normal rainfall. The drought of the 1930s is associated with the Dust Bowl of the Great Plains, when socioeconomic conditions, agricultural practices and drought forced the largest emigration of Oklahomans in state history.

The agricultural impact of drought is increasingly mitigated on a farm-by-farm and year-by-year basis through irrigation of crops, mostly with groundwater. This practice dominates much of the panhandle and some of the rest of western Oklahoma.

Thunderstorms and Tornadoes

On average, thunderstorms occur about 55 days per year in eastern Oklahoma, decreasing to about 45 days per year in the southwest. The annual rate increases to near 60 days annually in the extreme western panhandle. Late spring and early summer are the peak seasons for thunderstorms. December and January, on average, feature the fewest thunderstorms.

Frequent cold fronts, a favorable jet stream, and dry line development make springtime the preferred season for violent thunderstorms, although they can occur at any time of year. Severe weather threats during spring include squall lines, mesoscale convective systems, heat bursts, and rotating supercell thunderstorms that can produce very large hail, damaging winds, and tornadoes. Autumn marks a secondary severe weather season, but the relative frequency of supercell thunderstorms is much lower than during spring. Individual thunderstorms are common during the summer, but tend to be less severe and shorter lived. These storms can produce locally heavy rain and hail.

Tornadoes are a particular hazard in Oklahoma (Figure 7). Since 1950, an average of 53 tornadoes have been observed annually within the state's borders. Tornadoes can occur at any time of year, but are most frequent during springtime. Three-fourths of Oklahoma's tornadoes have occurred during April, May, and June. May's average of 20 tornado observations per month is the greatest. The winter months each average less than one tornado per month.

Severe weather can occur at any time of day, but the maximum frequency for severe weather is from mid-afternoon to sunset. About 80 percent of tornadoes are observed between noon and midnight Central Standard Time, with the peak hours being between 4:00 and 8:00 PM.

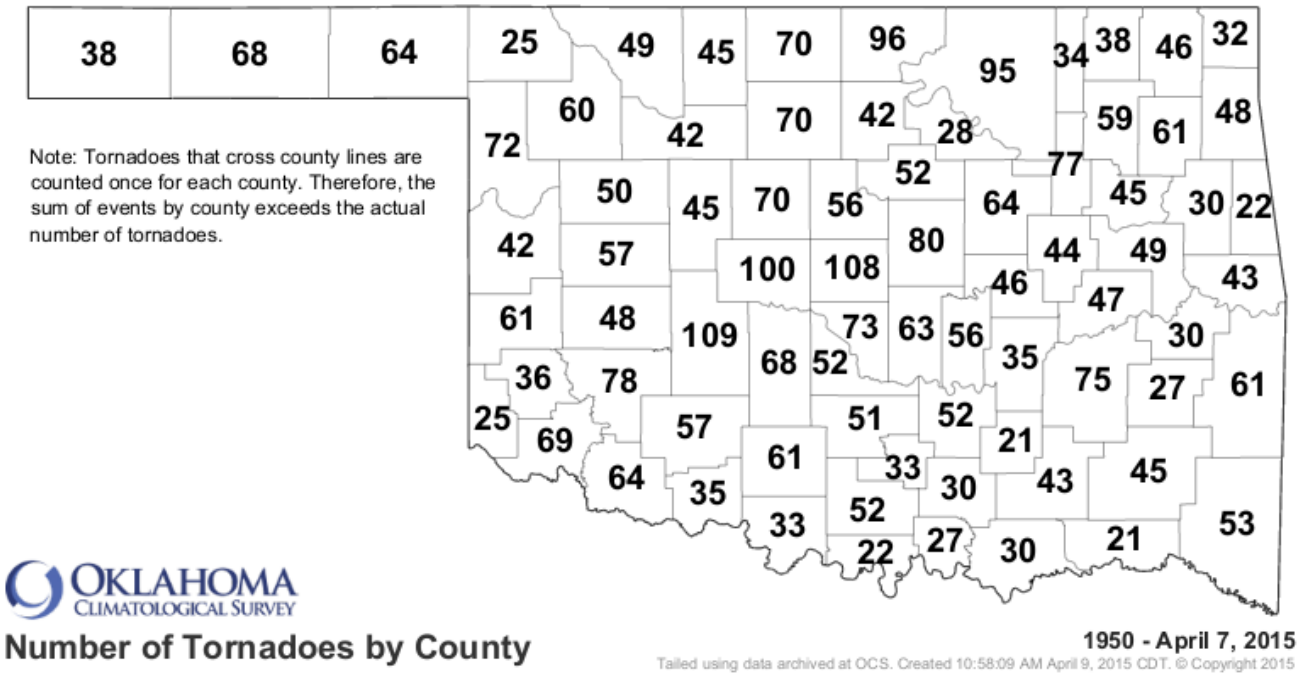


Figure 7: Map of the number of tornadoes recorded by county using data from 1950 to 2010.

Other Climatic Features

Annual average relative humidity ranges from about 60 percent in the panhandle to just over 70 percent in the east and southeast. On average, cloudiness increases from west to east across Oklahoma. The annual fraction of possible sunshine observed ranges from about 45 percent in eastern Oklahoma to near 65 percent in the panhandle. These fractions are highest in the summer and lowest in the winter for all portions of the state.

Average annual lake evaporation varies from 48 inches in the extreme east to 65 inches in the southwest, numbers that far exceed the average yearly rainfall in those areas. Evaporation and percolation into the soil expend about 80 percent of Oklahoma's precipitation.

Prevailing winds are from the south to southeast throughout most of the state from the spring through autumn months. These prevailing winds typically are from the south to southwest in far western Oklahoma, including the panhandle. The winter wind regime is roughly equal split between northerly and southerly winds.

(Source: http://climate.ok.gov/index.php/site/page/climate_of_oklahoma)

1.2.2 Population

Oklahoma's population has steadily increased since Statehood in 1907, with the exception of a slight decrease in population levels from 1930-1960 due to drought and economic depression.

US Census Data by Year	Total Population

2017	3,930,864
2016	3,921207
2015	3,904,353
2014	3,875,008
2013	3,849,840
2012	3,815,298
2011	3,785,232
2010	3,759,529

In 2006 approximately 67.7% of Oklahomans lived in areas defined as urban, and the rest lived in rural areas. The 2010 US Census indicated the urban population had fallen slightly to 66.24%. The State's two largest cities are Oklahoma City (the State Capital) and Tulsa.

(Source: https://www.census.gov/quickfacts/fact/table/OK,US/PST045217 https://www.census.gov/data/tables/2017/demo/popest/state-total.html)

1.2.3 Economy

2016 Oklahoma Gross Domestic Product by Industry

Industry	Dollar Amount (Millions)	Percentage of GDP
Private Industries	$151,849	84%
Federal, State, Local, and Tribal Government	$29,429	16%
Finance, insurance, real estate, rental, and Leasing	$25,513	14%
Manufacturing	$17,249	10%
Mining, quarrying, and oil and gas extraction	$18,511	10%
Educational services, health care, and social assistance	$14,161	8%
Professional and business services	$15,290	8%
Wholesale trade	$10,340	6%
Retail trade	$11,411	6%
Transportation and Warehousing	$9,526	5%
Construction	$7,777	4%
Arts, Entertainment, Recreation, Accommodation, and Food Services	$6,358	4%
Information	$4,554	3%
Agriculture, Forestry, Fishing, and Hunting	$2,783	2%

Utilities	$4,392	2%
Total		100%

(Source: OK Department of Commerce)

2017 Top Industries in Oklahoma

Industry	Total Employment	Employment Percentage
Health Care and Social Assistance	228442	13.12%
Retail Trade	191618	11.01%
Accommodation and Food Services	154800	8.89%
Educational Services	140179	8.05%
Manufacturing	133066	7.64%
Construction	104473	6.00%
Other Services (except Public Administration)	75088	4.31%
Transportation and Warehousing	65891	3.78%
Wholesale Trade	59640	3.43%
Mining, Quarrying, and Oil and Gas Extraction	50390	2.89%
Arts, Entertainment, and Recreation	44234	2.54%
Agriculture, Forestry, Fishing and Hunting	43164	2.48%
Public Administration - Local	33495	1.92%
Public Administration - Federal	32375	1.86%
Public Administration - State	31083	1.79%
Public Administration - Tribal	17950	1.03%
Utilities	15706	0.90%
Unclassified	70	0.00%
Total - All Industries	1740904	100.00%

(Source: OK Department of Commerce, 2017, 4th Quarter. Note: This information is comprised of Bureau of Labor Statistics data, which does not include active duty military employment as an "industry." Hence, this population segment is not reflected in the data.)

2018 Top 15 Employers in Oklahoma

Employer	Employee Estimate
Department of Defense	68,000-69,000
Wal-Mart Associates, Inc. (includes seasonal)	33,500-34,000
Integris Health, Inc.	8,500-9,000
Chickasaw Nation Enterprises (gaming and non-governmental business)	7,000-7,500
Oklahoma State University	7,000-7,500
OK Department of Human Services	6,500-7,000
OU Health Sciences Center	6,500-7,000
U.S. Postal Service	6,500-7,000
University of Oklahoma Norman Campus	6,500-7,000
Mercy Health (MHM Support Services)	6,000-6,500
Tulsa Public Schools	6,000-6,500
Braum's, Inc.	6,500-7,000

(Source: 2018 Statewide Estimate, https://okcommerce.gov/data/employers/)

CHAPTER TWO: THE PLANNING PROCESS

2.1 Planning Process Activities, Timeline, and Milestones Element (S1)

This plan update was coordinated and executed by the State Hazard Mitigation Officer (SHMO), OEM Hazard Mitigation Staff, and the State Hazard Mitigation Team (SHMT).

The planning process began in April 2017, when the SHMO presented the plan update timeline to the SHMT, and discussions began among team members as to how we could build upon and strengthen the current State HM Plan. Local, State and Federal partners were contacted via letter and email to begin the process of updating the State Plan. Stakeholders were requested to review their agency descriptions, mitigation programs, and provide input to the strategy and goals of the State Plan. These inputs were collected, reviewed, and revision were incorporated into the State Plan update throughout 2017 and 2018.

The SHMT has met quarterly since its kickoff meeting in April 2017. In addition, there have been regular meetings between the SHMO, OEM's HM Staff, and U.S. Army Corps of Engineers personnel. The drafting of the plan update began in April 2018.

2.2 Involvement and Coordination with Agencies and Stakeholders during the Planning Process Element S2

The establishment of Oklahoma's State Hazard Mitigation Team is required by state statue Title 63, Public Health and Safety, 63 O.S. §683.6, 2016 and is under the coordination of the State Hazard Mitigation Officer (SHMO) who may appoint ad hoc committees for the purpose of reviewing or researching issues. The SHMT provides expertise to the planning process, including historical perspectives, risk assessments, building codes, land use, transportation, and infrastructure.

Oklahoma's State Hazard Mitigation Team (SHMT)

Agency	State HM Team Member Title	Team Member Status
OK Department of Emergency Management	SHMO	Participation required by OK statue Title 63
National Weather Service (NWS)	Director	Stakeholder
U.S. Department of Agriculture (USDA)	State Executive Director	Subject Matter Experts
U.S. Army Corps of Engineers	Chief, Emergency Management	Stakeholder
U.S. Department of Housing and Urban Development	Senior Management Analyst	Subject Matter Experts
Oklahoma Department of Education (DOE)	State Superintendent	Stakeholder
U.S. Bureau of Indian Affairs (BIA)	Director	Subject Matter Experts
U.S. Bureau of Land Management (BLM)	Regional Director	Subject Matter Experts
U.S. Bureau of Reclamation (BOR)	Emergency Management Coordinator	Subject Matter Experts
U.S. Fish and Wildlife Service	Field Coordinator	Subject Matter Experts
USGS, Oklahoma Water Science Center	Director	Stakeholder
National Park Service (NPS)	Chickasaw Nat. Rec Area	Stakeholder
Small Business Administration (SBA)	Regional Administrator	Subject Matter Experts
American Red Cross (ARC)	Director/OKC	Stakeholder
Association of County Commissioners of Oklahoma	Executive Director	Participation required by OK statue Title 63
Oklahoma Department of Agriculture - Forestry Division	Director	Participation required by OK statue Title 63
Oklahoma Climatological Survey	University Meteorologist, OU Office of Emergency Preparedness	Participation required by OK statue Title 63
Oklahoma Department of Commerce	Regional Development Specialist	Participation required by OK statue Title 63
Oklahoma Conservation Commission	Administrative Programs Manager	Participation required by OK statue Title 63
Oklahoma Emergency Management Association	President	Participation required by OK statue Title 63
Oklahoma Department of Environmental Quality (DEQ)	Emergency Response Coordinator	Participation required by OK statue Title 63
Oklahoma Floodplain Managers Association (OFMA)	Chair	Stakeholder
Oklahoma Geological Survey (OGS)	Director	Stakeholder
Oklahoma Department of Health	Emergency Manager	Participation required by OK statue Title 63

Oklahoma State Historical Society	Historic Archeologist/Section 106 Program Coordinator	Participation required by OK statue Title 63
Oklahoma Department of Human Services	Human Resource Manager	Participation required by OK statue Title 63
Oklahoma Insurance Commission	Community Outreach Supervisor	Participation required by OK statue Title 63
Oklahoma Municipal League	Executive Director	Participation required by OK statue Title 63
Oklahoma Department of Transportation	Executive Director	Participation required by OK statue Title 63
Oklahoma Water Resource Board (OWRB)	State NFIP Coordinator	Participation required by OK statue Title 63
Oklahoma Department of Wildlife Conservation	Executive Director	Participation required by OK statue Title 63
Oklahoma Corporation Commission	Executive Director	Participation required by OK statue Title 63
Office of the State Fire Marshall	State Fire Marshall	Participation required by OK statue Title 63
Oklahoma Department of Labor	Commissioner	Participation required by OK statue Title 63
State Chancellor/Designee, OK State System of Higher Education	Director of Business Services	Participation required by OK statue Title 63
Oklahoma Department of Career and Technology Education	State Director	Participation required by OK statue Title 63
Oklahoma Office of Homeland Security	Critical Infrastructure Protection Coordinator	Provided THIRA Information

During the planning process, the SHMT decided to find a more descriptive way to evaluate hazards and risk analysis. This was accomplished by coordinating hazard profile updates with subject matter experts, and by utilizing U.S. Army Corps of Engineers (USACE) expertise and Geographic Information System (GIS) technology to update risk evaluation criteria.

The following agencies were requested to provide subject matter expertise on the following hazards:

Hazard	Agency
Dam Failure	OK Water Board/ USACE/OK Conservation Commission
Drought	OK Climatological Survey, University of OK
Earthquake	OK Geological Survey
Expansive Soils	OK Geological Survey
Extreme Heat	OK Climatological Survey, University of OK
Flood	OK Water Board/ USACE
Hail	OK Climatological Survey, University of OK
High Winds	OK Climatological Survey, University of OK

Landslides	OK Geological Survey
Lightning	OK Climatological Survey, University of OK
Subsidence	OK Geological Survey
Tornado	OK Climatological Survey, University of OK
Wildfire	OK Dept. of Agriculture, Forestry Division/OEM Field Services
Winter Storm	OK Climatological Survey, University of OK

Of particular importance and usefulness was the data received from the OK Geological Survey regarding earthquakes, since there has been an increase in activity in recent years.

In addition to the hazard data, the OEM planning staff engaged with other State and Federal agencies during the planning process to assess each principal SHMT agencies' respective capabilities and function. The SHMT meetings proved to be a valuable opportunity for agencies and stakeholders to provide input on natural hazard risk assessment and the impact on communities across Oklahoma. The following areas below discuss the coordination process of specific areas of interest:

Area of Interest	How the State Coordinated with other Agencies and Stakeholders
Emergency Management	SHMT planning meetings were open to other Emergency Managers across OK, which resulted in the attendance and opportunity for feedback of local community personnel.
Economic Development	Analyzed trends in Oklahoma's economy and employment with OK Dept. of Commerce, focusing on the most important industries and employers throughout the State.
Land Use and Development	Coordinated with USACE personnel to evaluate land use trends and analyze how new development increases/decreases the impact of natural hazards.
Housing	Discussed the mitigation capabilities of the U.S. Dept. of Housing and Urban Development (HUD) with HUD's Senior Management Analyst, focusing on the purpose and scope of Community Development Block Grants.
Health and Social Services	Reviewed agency core functions and mitigation capability with OK Department of Human Services personnel.
Infrastructure	Obtained the must current (2018) list of Critical Facilities across OK, coordinating with USACE and OMES personnel to include this information in the GIS risk analysis.
Natural and Cultural Resources	Discussed natural systems with USACE, with particular attention paid to waterways and high hazard dams. Reviewed agency core functions and mitigation capability with U.S. Bureau of Indian Affairs and the State Historic Preservation Office (SHPO).

2.3 Integrating the Planning Process into Other State Planning Element (S1)

EMAP, the voluntary standards, assessment, and accreditation process for disaster preparedness programs throughout the country, fosters excellence and accountability in emergency management and homeland security programs, by establishing credible standards applied in a peer review accreditation process.

The ANSI/EMAP 4-2016 Emergency Management Standard by EMAP is the set of 64 standards by which programs that apply for EMAP accreditation are evaluated.

The Emergency Management Standard covers:

- Program Management, Administration and Finance, and Laws and Authorities
- Hazard Identification, Risk Assessment and Consequence Analysis
- Hazard Mitigation
- Prevention
- Operational Planning and Procedures
- Incident Management
- Resource Management, Mutual Aid and Logistics
- Communications and Warning
- Facilities
- Training
- Exercises, Evaluations and Corrective Action
- Emergency Public Education and Information

In April 2018, OEM was accredited by EMAP, in accordance with the Emergency Management Accreditation requirements.

CHAPTER THREE: HAZARD IDENTIFICATION AND RISK ASSESSMENT

3.1 Hazard Overview and List of Declared Events Element (S3/S4)

Through the planning process, it was decided that the following eleven natural hazards would be profiled in the State Plan:

- Dam Failure
- Drought
- Earthquake
- Extreme Heat
- Flood
- Severe Storms (Hail, Lightning)
- High Winds
- Soil Hazards
- Tornado
- Wildfire
- Winter Storms (Ice, Freezing Rain, Snow)

These hazards listed are in alphabetical order, and not prioritized in order of risk and vulnerability. Included within certain hazard profiles are generally accepted methods in various disciplines of that hazards measurement, impact, or scale. Probability and occurrence data was retrieved for each hazard was considered to best reflect the hazard and its periodicity to the planning area. Specific events and occurrences were included in certain profiles as a benchmark to reference occurrences of that hazard. These benchmarks are often considered or used to compare hazard events against, i.e. 2015 Statewide Flooding that effected multiple jurisdictions.

3.2 Probability and Risk Analysis Criteria Element (S3/S4)

Each hazard in the State Plan was analyzed using probability, severity, warning time, and duration data. This multi-faceted approach enables State and Local users of the State Plan to prioritize the effects of each hazard in a more complete way.

Probability

The likelihood of the hazard occurring again in the future, considering both the hazard's historical occurrence and the projected likelihood of the hazard occurring in any given year.

Score	Description	Explanation
1	Unlikely	Less than 10% probability in any given year (below 1 in 10 chance of occurring), history of events is less than 10% likely or the event is unlikely but there is a possibility of its occurrence.
2	Possible	Between 10% and 19% probability in any given year (less than 1 in 5 chance of occurring), history of events is greater than or equal to 10% but less than 20% for the event could possibly occur.
3	Likely	Between 20% and 33% probability in any given year (up to 1 in 3 chance of occurring), history of events if greater than or equal to 20% and not more than 33% the event is likely to occur.
4	Highly Likely	More than 33% probability in any given year (event has up to a 1 in 1 chance of occurring), history of events is greater than 33% likely or the event is highly likely to occur.

Impact

Assessment of severity in terms of injuries and fatalities, personal property, and infrastructure with regard to vulnerability to the hazard.

Score	Description	Explanation
1	Negligible	Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours, and/or injuries/illnesses treatable with first aid.
2	Limited	10% to 25% of property severely damaged, shutdown of facilities and services for more than a week, and/or injuries/illnesses that do not result in permanent disability.
3	Critical	More than 25% and up to 50% of property severely damaged, shutdown of facilities and services for at least 2 weeks, and/or injuries/illnesses that result in permanent disability.
4	Catastrophic	More than 50% of property severely damaged, shutdown of facilities and services for more than 30 days, and/or multiple deaths.

Warning Time

The potential amount of warning time that is available before the hazard occurs.

Score	Description
1	More than 24 hours warning time
2	12 to up to 24 hours warning time
3	6 to up to 12 hours warning time
4	Minimal or no warning (Less than 6 hours warning)

Duration

A measure of the duration of time that the hazard will affect the state.

Score	Description
1	6 hours or less
2	Up to 1 day
3	Up to 1 week
4	More than 1 week

3.3 Hazard Profiles Element (S4)

The following data will be discussed in each hazard profile:

Hazard Profile Elements	Data to be Discussed
Description	A brief explanation of each hazard.
Location	A description of which areas of the state experience this hazard. When needed, maps will accompany the narrative description.
Previous Occurrences	Previous occurrence events that are relevant and informative of the hazard.
Probability of Future Events and Risk Calculation	A summary of the probability, impact, warning time, and duration of the event. Narrative regarding if the risk from the hazard is expected to increase or decrease in the future.
Jurisdictions Most Vulnerable to Hazard and Potential Loss of Vulnerable Structure	A summary of jurisdictions and/or regions most threatened by each hazard, and a summary of jurisdictions most susceptible to damage and loss from hazard events related to populations and assets (such as infrastructure, critical facilities, systems, and potential dollar losses).

3.3.1 Dam/ Levee Failure

Description: The Federal Emergency Management Agency (FEMA) defines a dam as "an artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material for the purpose of storage or control of water." Dams typically are constructed of earth, rock, concrete, or tailings (chaff) from mining operations. A dam failure is the collapse, breach, or other failure resulting in downstream flooding. The amount of water impounded in the reservoir behind a dam is measured in acre-feet. As a function of upstream topography, even a very small dam may impound or detain many acre-feet or millions of gallons of water.

A break in a dam produces an extremely dangerous flood situation because of the high velocities and large volumes of water. In the event of a dam failure, the potential energy of the water stored behind even a small dam can cause great property damage, as well as loss of life if there are people downstream from the dam. The extent of this inundation may be minimal to uninhabited farmland or catastrophic in an urban environment.

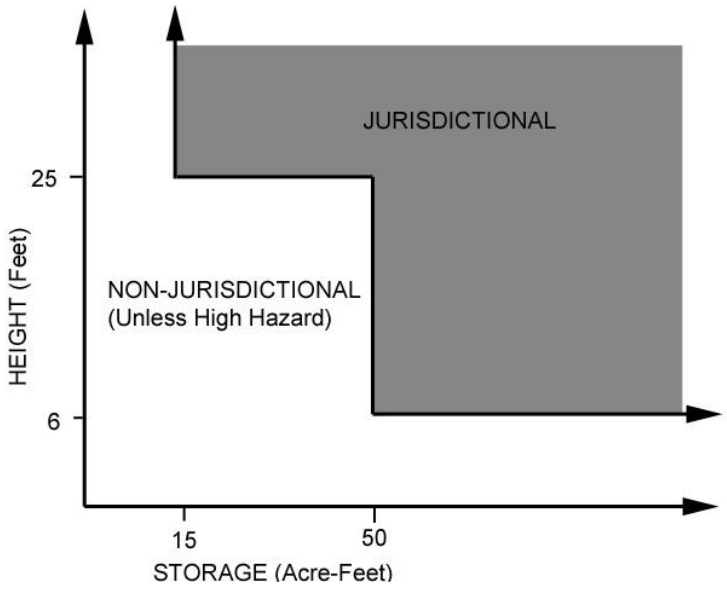
Dam failures are most likely to happen for one of these reasons:

- Overtopping caused by water spilling over the top of a dam
- Structural failure of materials used in dam construction
- Cracking caused by movements like the natural settling of a dam
- Inadequate maintenance and upkeep.
- Piping when seepage through a dam is not properly filtered and soil particles continue to progress and form sinkholes in the dam.
- Geological instability caused by changes to water levels during filling or poor surveying.
- Human, computer or design error.

Earthquakes can certainly cause damage to dams but complete failure of a large dam due to earthquake damage appears to be very rare. Flooding can occur downstream from a dam without the structure being breached. Sometimes, to prevent overtopping and catastrophic failure, dams are forced to make emergency releases of large amounts of water, which can cause downstream flooding.

Any dam that has a height of 25 feet or more from the natural streambed and/or 50 acre-feet or more of storage capacity, is under the jurisdiction of the Oklahoma Water Resources Board (OWRB).

The OWRB also classifies dams as high-hazard, significant-hazard, and low-hazard, depending on the downstream populations and infrastructure. The hazards are based on first, potential for loss of life from a breach and secondly from the level of economic damage that will occur downstream from a breach.



OWRB Jurisdictional Sizes of Dams

Hazard-Potential Classification	Risk Involved with Dam Failure	Inspection Frequency
High	probable loss of human life	annually, by a registered professional engineer
Significant	no probable loss of human life but can cause economic loss or disruption of lifeline facilities	every three years by a registered professional engineer
Low	no probable loss of human life and low economic loss	every five years

Source: OWRB Dam Safety; Hazard Potential and required inspection frequency.

Levee Failure

According to the Federal Emergency Management Agency, a levee is “a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.”

Levees are considered structural flood control projects and are generally constructed to protect floodplain development. Until the late 1960s, structural measures such as levees were the dominant approach to riverine floodplain management.

Levee failures can cause catastrophic floods, releasing sudden walls of water that can sweep across lands thought to be protected by the structure. Thus, levees may create a false sense of security, increasing the amount of property at risk of flooding as people and businesses locate behind levees and floodwalls, believing they are totally safe. In addition, levees, dams, and other structural measures are extremely costly and can disrupt or destroy the natural environment.

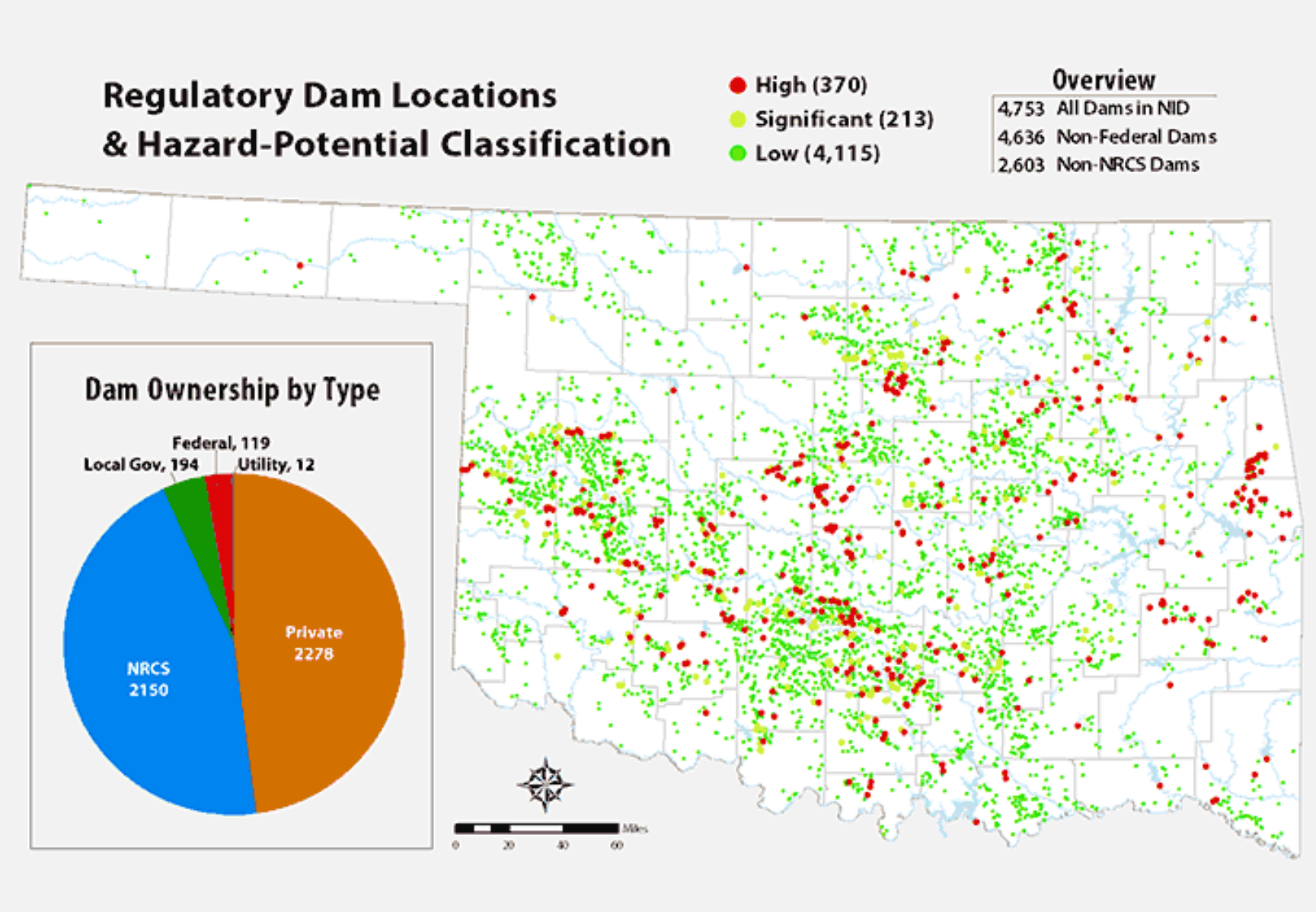
According to the USACE National Levee Inventory Database, there are 82 Levee Systems in Oklahoma. The 82 are composed of the following;

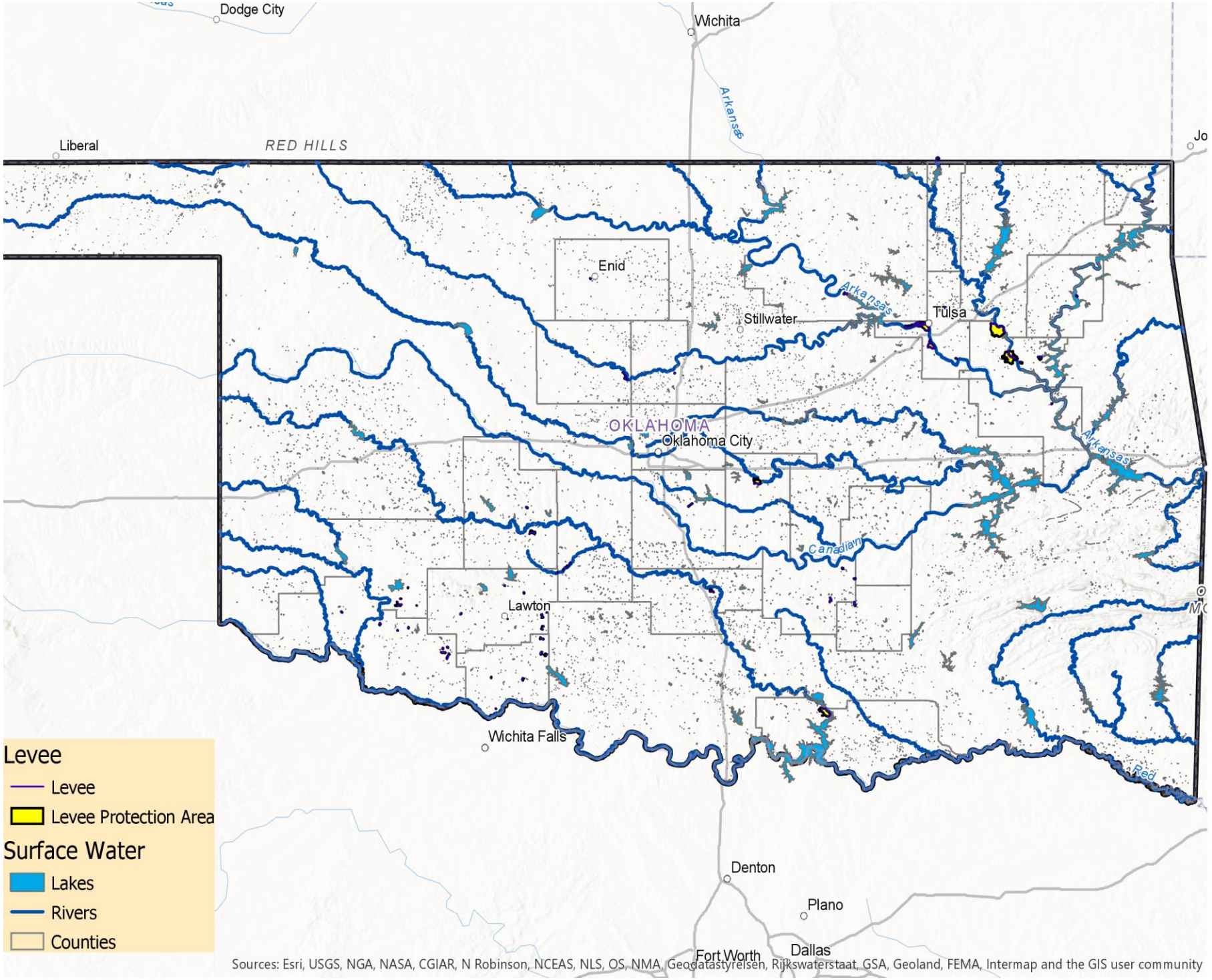
(4) USACE Federally Constructed and Operated.

(6) USACE Federally Constructed/ Operated by Public Sponsor

(72) Locally Constructed and Operated

Locations: Additional Levee maps are located in Appendix C




Dodge City
Wichita
Liberal
RED HILLS
Arkansas
Enid
Stillwater
Tulsa
OKLAHOMA
Oklahoma City
Canadian
Lawton
Wichita Falls
Red
Denton
Plano
Fort Worth
Dallas
Levee
Levee
Levee Protection Area
Surface Water
Lakes
Rivers
Counties
Sources: Esri, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

There are 370 dams that are classified as “High hazard”. High hazard dams are those where failure will probably cause loss of human life.
There are 213 dams that are classified as “Significant hazard”. Significant hazard dams are those where failure would result in no probable loss of human life but can cause economic loss or disruption of lifeline facilities.
There are 4,115 dams that are classified as “Low”. Low Hazard Dams are those where failure would result in no probable loss of human life and low to limited economic loss or disruption of lifeline facilities.

The 370 high hazard dams in Oklahoma include federally constructed and maintained dams that are not regulated by the State of Oklahoma. These additional dams are operated on federally built and controlled lakes throughout Oklahoma that are under control of federal agencies including the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and the Natural Resources Conservation Service of the USDA. These Federally controlled dams have not been profiled due to their ownership status and limited availability of risk and breach impact information due to federal regulations.

Previous Occurrences: Several dams are damaged and failed in the past several years:

1. Sugar Creek L-44 (high hazard) dam was damaged in 2007.
2. Wilson C. dam (significant hazard) dam failed in 2015.
3. Atoka dam (high hazard) dam was damaged in 2015.
4. Camp Classen dam (significant hazard) dam was damaged in 2015.
5. 10 low hazard dams were either damaged or failed in the past 10 years.

Probability of Future Events and Risk Calculations: The potential for future dam breaks, while **unlikely**, is possible considering the design age of many of the dams in the state.

Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(1 x .45)	+ (4 x .30)	+ (3 x .15)	+ (4 x .10)	= 2.50

Resources: Oklahoma Conservation Commission; Oklahoma Association of Conservation Districts; Oklahoma Water Resources Board ; U.S. Army Corp of Engineers; U.S. Natural Resources Conservation Service

Jurisdictions Most Vulnerable to Hazard: Those jurisdictions whom are located in proximity and downstream to those dams that are designated High Hazard by OWRB have the highest potential vulnerability due to their design criteria and population risk. This vulnerability includes probable loss of life, significant to overwhelming physical damage to infrastructure and loss of economic resources.
Those jurisdictions located within the proximity and downstream of dam’s designated significant hazard may have a reduced vulnerability yet may still experience significant economic loss or disruption of lifeline facilities in the event of a dam failure.

The planning team has identified several dam locations and their potential impacts may result in effects that would be on a regional and national scale.

Keystone Lake and Skiatook Lake

The City of Tulsa Oklahoma has identified in their local hazard Mitigation plan the impacts of a failure of (2) high hazard dams to the community.

Keystone Lake Dam

General Location: 8 miles west of Sand Springs Source: Arkansas River

Owner/Operator: United States Army Corps of Engineers Year Completed: 1964

Length: 4,600 feet

Height: 121 feet

Maximum Storage: 1,348,000 acre feet of water Land Area:

26,020 surface acres of water

Skiatook Lake Dam

General Location: 6 miles northwest of Sperry Source: Hominy Creek

Owner/Operator: United States Army Corps of Engineers Year Completed: 1984

Length: 3,590 feet

Height: 143 feet

Maximum Storage: 893,000 acre feet of water Land Area:

10,540 surface acres of water

The economic impacts resulting from a breach of, or major emergency release from, Keystone Dam would impact a total of 2,085 properties in West and South Tulsa County, and do a total of $80,233,810 damage. A Skiatook Dam failure or breach would send a wall of water into the Hominy Creek and Bird Creek floodplains, which in many reaches are 2 miles wide. The resulting property damage in North Tulsa County would be $47,442,910 to residential parcels, $47,527,400 to commercial, $13,332,500 to industrial, $161,600 to agricultural, totaling an estimated $163 million damage. In the event of a dam failure, the Arkansas River bisects the metropolitan area, and the potential impacts to transportation routes such as I-44 and railroads would cause severe regional and national economic impacts.

Eufaula Lake

Eufaula Lake is a reservoir in Oklahoma, and is located on the Canadian River, 27 mi (43 km) upstream from its confluence with the Arkansas River and near the town of Eufaula. The lake covers parts of McIntosh County, Pittsburg, Haskell and Okmulgee counties and drains 47,522 square miles (123,080 km2). Water sources include the Canadian, North Fork Canadian and Deep Fork rivers.[1] It is the largest-capacity lake in the state of Oklahoma with a volume of 2,099,000 acre feet (2.589×109 m3), a surface area of 102,000 acres (410 km2) and 600 miles (970 km) of shoreline. The U. S. Army Corps of Engineers began construction of the 975 meter-long (3,199 feet) Eufaula Dam wall in 1956 and was completed in 1964.

A dam failure of Eufaula Lake would inundate residences, businesses, farms and ranches forcing residents to relocate. Loss of crops and livestock would cause huge economic loss to farmers, ranchers, and local economies. Major transportation arteries including Highway's 2, 9, 71, or 82 are at risk from flooding or washout and would force motorist and first responders to find alternate routes of travel. The failure of Lake Eufaula would result in the loss of the hydroelectric power station, which provides 90,000 kilowatts of electric power. A failure of Eufaula dam may also put at risk additional downstream high hazard dams on the Arkansas River, which would extend the impact area to multiple counties and across state lines to neighboring states.

Grand Lake, Lake Hudson High Hazard Dams and Salina Levee

Vulnerability

Population

People, property, critical facilities, and infrastructure downstream of dams and behind levees could be subject to devastating danger and damage in the event of failure. Approximately 6,455 people in Mayes County live within the inundation area of a Dam or Levee Failure. The number of fatalities or injuries resulting from dam or levee failures is highly influenced by the number of people occupying the inundation area, the amount of warning they are provided, and the amount of pre-event public education and planning. People who might be at risk include those who are living, working, at school or play, or traveling through vulnerable areas.

Structures/Buildings

Residences and outbuildings in the inundation areas shown in Figure 4-22 would be most at risk in the event of a dam or levee failure. Table 4-52 summarizes the vulnerability of parcels touched by the Dam inundation area in Mayes County.

Mayes County Improved Parcels Touched by Dam Failure

Improvement Type	Number	Value
Agriculture	624	47,613,025
Residential	2,116	139,174,975

Commercial	43	9,807,600
Tax Exempt	196	*Data Not Available*
Total	2,979	196,595,600

Critical Facilities

There are two critical facilities in unincorporated Mayes County and four County facilities (located in Pryor) that would be impacted by a failure of a Dam in Mayes County

Infrastructure

Water Treatment – A significant failure a dam or levee in Mayes County would impact Rural Water District #6 that services much of the northeast part of the County. The impact could include contamination of the community's water supply, or a complete failure of the system.

Utilities:

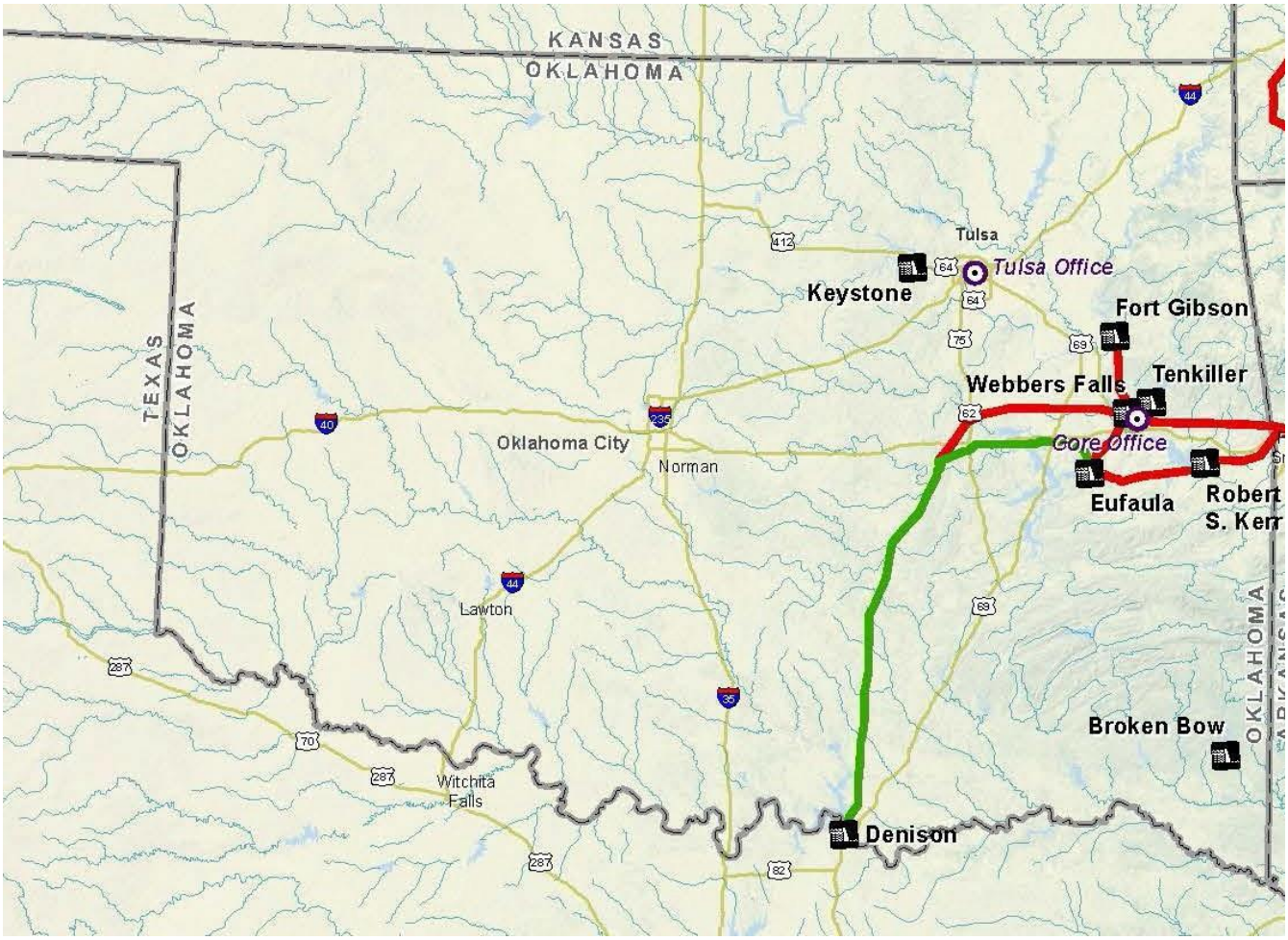
Electricity – The Grand River Dam Authority (GRDA) is a non-profit Oklahoma agency created to control, develop, and maintain the Grand River waterway. It was created by the Oklahoma state legislature in 1935, and is headquartered in Vinita, Oklahoma. GRDA was designed to be self-funding from the sales of electricity and water. According to GRDA's 2012 Annual Report, the agency had nearly US $412 million in operating revenue for 2012, compared to nearly US $395.5 million in 2011. GRDA operates three hydroelectric facilities and two reservoirs, Grand Lake, Lake Hudson, and the Salina Pumped Storage Project, which includes Lake W. R. Holway, It also owns and operates the GRDA Energy Center (formerly named the GRDA Coal-Fired Complex). GRDA's jurisdiction covers 24 counties in northeastern Oklahoma. GRDA transmits and delivers this electricity across its 24-county service area in Northeast Oklahoma via a sophisticated energy delivery system. GRDA sells electricity to three customer classes: municipals, electric cooperatives and industries.

Gas – Transmission pipelines could be breached both through trees being uprooted, affecting the lines in their dripline, and ground being washed out, exposing the pipelines to damage.

Transportation Systems (Highways, Public Transportation, Railway, Airports) – Significant flooding caused by dam failures or high releases would cause some regional road flooding for highways, limiting access to the area. Bridges crossing the nearby rivers and creeks may be overtopped, further limiting ground transportation. In Mayes County, virtually all major access routes through the county are vulnerable to dam failure including: State Hwy 20, State Hwy 28, State Hwy, 82, US Hwy 69, US Hwy 412. To what degree these would be impacted can only be determined by a detailed hydrological study.

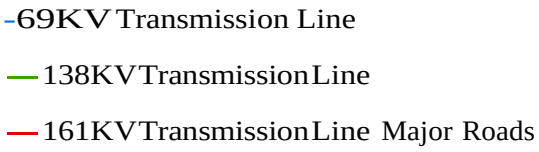
Regional Electrical Service

Southwestern Power Administration (SWPA) was established in 1943 by the Secretary of the Interior as a Federal Agency that today operates within the Department of Energy under the authority of Section 5 of the Flood Control Act of 1944. As one of four Power Marketing Administrations in the United States, Southwestern markets hydroelectric power in Arkansas, Kansas, Louisiana, Missouri, Oklahoma, and Texas from 24 U.S. Army Corps of Engineers multipurpose dams. By law, Southwestern's power is marketed and delivered primarily to public bodies such as rural electric cooperatives and municipal utilities. Southwestern has over one hundred such "preference" customers, and these entities ultimately serve over eight million end-use customers. Southwestern operates and maintains 1,380 miles of high-voltage transmission lines, substations, and a communications system that includes microwave, VHF radio, and state-of-the-art fiber optics.



O SWPA Offices

II Federal Hydropower Projects


69KV Transmission Line
138KV Transmission Line
161KV Transmission Line
Major Roads

3.3.2 Drought

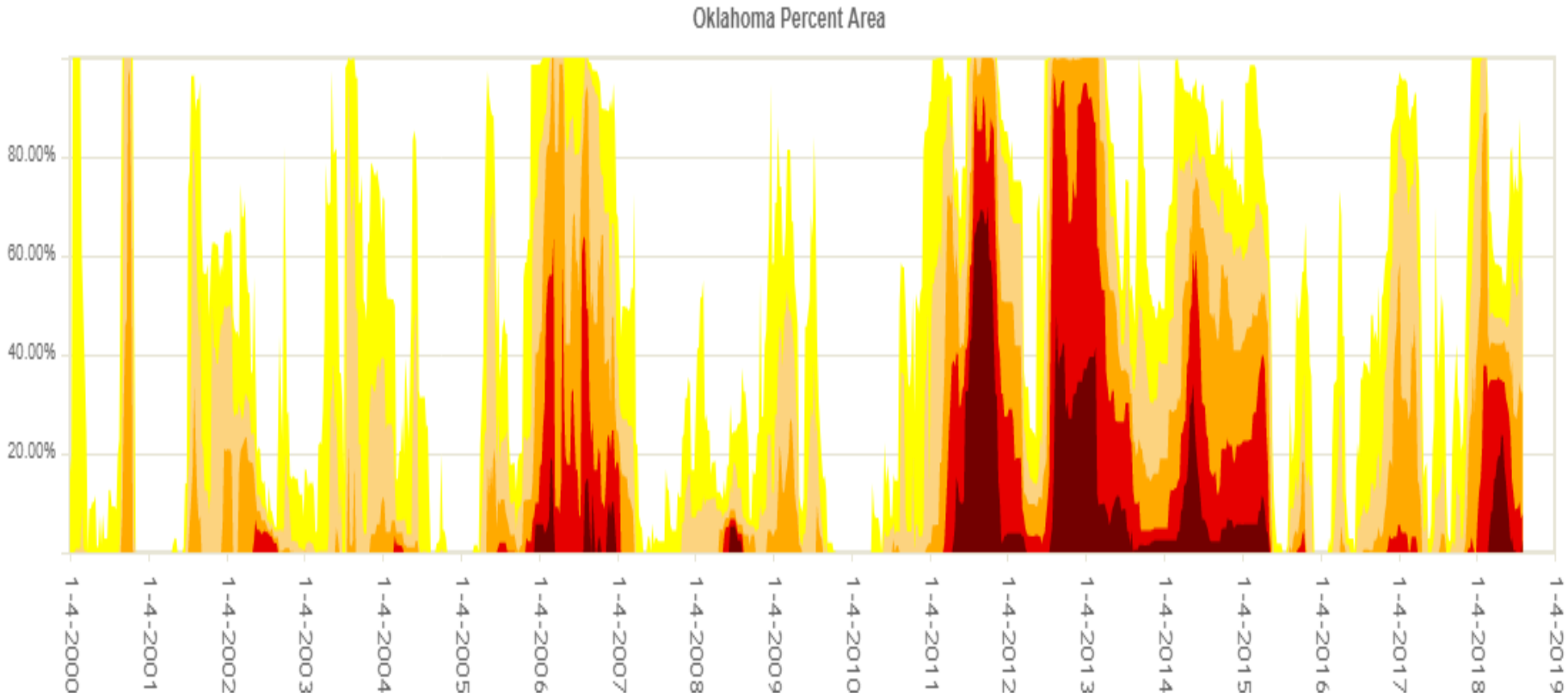
Description: A drought is defined as "a period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic imbalance in the affected area." -Glossary of Meteorology (1959).
In easier to understand terms, a drought is a period of unusually persistent dry weather that persists long enough to cause serious problems such as crop damage and/or water supply shortages. The severity of the drought depends upon the degree of moisture deficiency, the duration, and the size of the affected area.

There are four different ways that drought can be defined.

- Meteorological-a measure of departure of precipitation from normal. Due to climatic differences, what might be considered a drought in one location of the country may not be a drought in another location.
- Agricultural-refers to a situation where the amount of moisture in the soil no longer meets the needs of a particular crop.
- Hydrological-occurs when surface and subsurface water supplies are below normal.
- Socioeconomic-refers to the situation that occurs when physical water shortages begin to affect people.

Location: Drought maybe experienced anywhere in the State of Oklahoma.

Previous Occurrences



Percent of Oklahoma under D0-D4 Level of Drought Since 2000
Source: Oklahoma Climatological Survey

The graph above details the percent of the state that was under the Drought Designator of D0 through D5 in that year. For example, in 2017, approximately 5% of the state area was considered in D3 status of Extreme drought, while throughout the same year, 30 to 60% was classifies as in a D2 Severe Drought, 75-80% of the area was under D1 Moderate Drought and 90-95% of the state area was classified as D0, Abnormally Dry. Those areas on the graph that have multiple drought classifications and multi-year periods indicate those periods that have been classified as having a drought. The classification of the category of Droughts is detailed in the following graph, including their associated impacts, of which the state may experience all five levels of drought classification.

Drought Severity Classification

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Short and Long-term Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	21-30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	6-10
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2	0-2	-2.0 or less	0-2

Source: U.S. Drought Monitor Statistics Graph (2000-present) National Drought Mitigation Center

Probability of Future Events and Risk Calculations: Drought has always been part of Oklahoma's climate because of highly variable precipitation patterns. However, droughts are projected to increase in severity and frequency due to climate change. Even if annual precipitation amounts do not change much, higher temperatures will increase evaporation from lakes, soils, and plants, stressing agricultural and natural systems. Models project that Oklahoma will experience a decrease in soil moisture across all seasons by the end of the century, with the greatest decrease in the summer (Wehner et al. 2017). Further, rising temperatures will lead to increased demand for water and energy, which could stress natural resources (Shafer et al. 2014). (Source: SCIPP, 2018: Simple Planning Tool for Oklahoma Climate Hazards, L. T. Kos and R. E. Riley, eds., Southern Climate Impacts Planning Program, 31 pp. [Available online at: http://www.southernclimate.org/documents/OK_SPT.])

The CPRI for Drought hazard is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(3 x .45)	+ (4 x .30)	+ (1 x .15)	+ (4 x .10)	= 3.1

Resources: Oklahoma Climatological Survey; Oklahoma Mesonet; Oklahoma Water Resources Board; National Drought Mitigation Center; National Integrated Drought Information System; National Weather Service

Jurisdictions Most Vulnerable to Drought Hazard

Forecast by County for the State

Table 27 summarizes statewide demands by sector and Table 28 summarizes all sector demands by county through the forecast period. Total water demand is projected to increase from nearly 1.8 million AFY in 2007 to over 2.4 million AFY in 2060. In the base year, crop irrigation accounts for nearly half (41 percent) of total water demand and M&I Public-Supply accounts for 33 percent of total water demand. The percentages remain relatively the same throughout the forecast period. The demands in the summary tables include system losses from the public-supply sectors and include total withdrawals for thermoelectric power generation.

Table 27 - Summary of Sector Demands, Statewide (AFY)

SECTOR	2007	2010	2020	2030	2040	2050	2060
M&I Public-Supply*	583,901	601,891	647,038	682,391	713,982	743,158	772,773
Self-Supplied Residential	29,524	30,217	32,610	34,770	36,863	38,978	41,155
Self-Supplied Industrial	89,942	88,780	87,558	92,313	96,730	101,258	105,683
Thermoelectric Power**	252,127	260,539	290,660	324,262	361,750	403,571	450,227
Livestock	94,087	94,480	95,792	97,104	98,416	99,728	101,040
Irrigation	736,074	745,210	775,661	806,112	836,562	859,932	897,464
Oil and Gas Activities	29,107	42,107	74,403	78,202	90,080	102,536	115,570

Total All Sectors	1,814,763	1,863,224	2,003,721	2,115,154	2,234,382	2,349,161	2,483,912

Table 28 - Summary of Water Demands by County, All Sectors (AFY)*

County	2007	2010	2020	2030	2040	2050	2060
Adair	5,465	5,844	7,038	7,401	7,904	8,291	8,709
Alfalfa	7,323	7,536	8,192	8,884	9,620	10,314	11,262
Atoka	5,726	5,920	6,556	7,218	7,879	8,534	9,294
Beaver	37,314	37,846	39,173	40,524	41,923	43,149	44,865
Beckham	14,744	15,044	15,685	16,425	17,202	18,018	18,918
Blaine	11,212	11,352	11,677	12,081	12,502	12,940	13,418
Bryan	26,824	27,209	28,271	29,395	30,519	31,596	32,794
Caddo	43,178	44,399	48,167	51,975	55,901	59,322	64,128
Canadian	27,622	29,394	34,610	34,329	34,746	34,634	34,247
Carter	14,668	15,905	19,542	18,278	17,750	16,850	15,602
Cherokee	9,601	9,988	11,059	12,238	13,432	14,579	15,790
Choctaw	10,827	11,155	12,238	13,368	14,620	15,954	17,493
Cimarron	63,338	65,080	70,895	76,683	82,445	86,916	94,040
Cleveland	39,261	40,675	43,889	46,510	48,670	50,238	51,879
Coal	3,186	3,763	5,521	4,687	4,267	3,644	2,808
Comanche	21,864	23,548	25,246	26,726	28,045	29,213	30,424
Cotton	2,263	2,316	2,459	2,589	2,719	2,837	2,993
Craig	3,994	4,225	4,951	5,699	6,477	7,142	8,052
Creek	9,867	10,161	10,875	11,506	12,124	12,745	13,435
Custer	12,025	12,357	13,025	13,693	14,410	15,090	15,840
Delaware	8,224	8,481	9,245	10,051	10,881	11,770	12,694
Dewey	7,069	7,172	7,324	7,518	7,741	8,025	8,337
Ellis	25,103	26,099	29,300	32,744	36,391	39,721	44,456
Garfield	19,744	20,018	20,610	21,045	21,478	21,867	22,317
Garvin	8,137	8,496	9,358	10,186	11,051	11,862	12,932
Grady	20,262	20,691	21,547	22,432	23,343	24,320	25,375
Grant	3,415	3,496	3,676	3,883	4,106	4,392	4,696
Greer	6,881	7,548	9,754	11,947	14,159	15,861	18,582
Harmon	27,569	27,812	28,569	29,343	30,117	30,720	31,665
Harper	13,112	13,416	14,311	15,238	16,210	17,105	18,326
Haskell	6,114	6,625	8,193	10,174	12,535	15,217	18,391
Hughes	8,620	9,997	14,207	13,700	13,935	13,564	13,286
Jackson	106,924	107,669	110,075	112,482	114,846	116,708	119,498
Jefferson	2,457	2,484	2,553	2,617	2,683	2,756	2,845
Johnston	5,183	5,378	6,097	6,961	7,867	8,749	9,893
Kay	24,155	24,705	25,684	26,285	26,856	27,436	28,065
Kingfisher	13,528	13,821	14,663	15,597	16,550	17,433	18,564
Kiowa	6,877	6,946	7,129	7,300	7,474	7,635	7,857
Latimer	4,038	4,393	5,276	6,216	7,232	8,185	9,445
Le Flore	25,779	26,477	28,716	31,365	34,439	37,947	41,929
Lincoln	8,684	8,953	9,685	10,505	11,459	12,549	13,783
Logan	10,425	10,794	11,882	13,149	14,505	15,932	17,506
Love	4,753	4,987	9,142	9,961	10,801	11,551	12,526
Major	16,591	16,802	17,156	17,522	17,949	18,410	18,936
Marshall	7,406	7,719	9,676	10,312	11,064	11,765	12,518
Mayes	12,392	12,736	13,855	15,082	16,402	17,787	19,319
McClain	14,974	15,487	17,122	18,889	20,771	22,799	25,006
McCurtain	43,372	42,973	42,973	44,961	46,758	48,570	50,506
McIntosh	4,143	4,450	5,380	6,544	7,946	9,597	11,474
Murray	3,043	3,192	3,609	4,074	4,521	4,975	5,499
Muskogee	142,794	145,950	157,906	172,310	188,144	205,719	225,234
Noble	4,111	4,270	4,544	4,807	5,102	5,416	5,763

Nowata	2,723	2,935	3,403	3,912	4,443	4,966	5,603
Okfuskee	4,210	4,370	4,782	5,219	5,698	6,174	6,792
Oklahoma	137,389	141,512	150,167	157,097	162,877	167,742	172,792
Okmulgee	12,816	13,118	13,998	14,811	15,670	16,573	17,496
Osage	12,451	12,846	13,833	14,722	15,601	16,474	17,507
Ottawa	7,203	7,400	7,925	8,396	8,900	9,407	9,944
Pawnee	40,252	41,604	46,380	51,661	57,534	64,055	71,313
Payne	15,167	15,761	16,935	18,195	19,474	20,477	21,484
Pittsburg	31,008	34,277	44,287	41,846	41,605	40,553	38,853
Pontotoc	8,941	9,388	10,608	11,763	12,937	13,928	15,305
Pottawatomie	10,835	11,225	12,322	13,547	14,839	16,134	17,695
Pushmataha	2,476	2,527	2,679	2,842	3,015	3,206	3,400
Roger Mills	11,576	11,899	12,419	13,028	13,734	14,532	15,433
Rogers	39,070	40,432	44,922	49,708	54,771	60,261	66,312
Seminole	22,457	23,316	26,108	29,185	32,619	36,393	40,710
Sequoyah	11,910	12,198	13,109	14,191	15,255	16,315	17,434
Stephens	12,848	13,360	14,586	15,737	16,971	18,155	19,755
Texas	223,906	224,653	227,314	232,447	237,694	242,743	248,480
Tillman	20,415	20,518	20,852	21,183	21,524	21,818	22,254
Tulsa	128,952	132,440	140,864	148,011	153,893	159,107	164,638
Wagoner	21,800	22,285	23,844	25,371	26,928	28,574	30,369
Washington	13,046	13,389	14,088	14,503	14,987	15,456	16,037
Washita	8,354	8,717	9,729	10,947	12,380	13,998	15,934
Woods	8,466	8,726	9,205	9,733	10,297	10,849	11,577
Woodward	20,310	20,568	21,076	21,697	22,264	22,923	23,579
Grand Total	**1,814,763**	**1,863,224**	**2,003,721**	**2,115,154**	**2,234,382**	**2,349,161**	**2,483,912**

*Including system losses for M&I Public-Supply and total withdrawals for Thermoelectric Power

Drought and Its Impact on Agricultural Water Resources in Oklahoma

February 2018

Drought impacts on Agricultural Water Resources

Agriculture is usually the first sector to be affected by the onset of drought because it relies on precipitation and soil moisture availability during various crop growth stages. It is important to note that areas with sufficient irrigation water supply may have less susceptibility to drought. For example, the Oklahoma Panhandle has access to Ogallala aquifer groundwater to meet irrigation demand even during droughts, whereas many growers in southwest Oklahoma rely on surface water for irrigation, which may run dry during long-term droughts. However, the cost associated with and the sustainability of tapping groundwater resources are additional factors to be considered for the overall analysis of drought impacts on agricultural productivity. During drought events, available water resources deplete at a faster rate, creating serious sustainability issues for the long term.

In Oklahoma, irrigated agriculture accounts for 41 percent of total water use, which is about 744,000 acre-feet (242 billion gallons) per year. The future water demand projection in the Oklahoma Comprehensive Water Plan suggests that crop irrigation will remain a major water user in the future, with a projected annual demand of about 900,000 acre-feet (293 billion gallons) in 2060. The continuous increase in irrigation demand makes agricultural water resources more vulnerable to frequent and severe droughts. This requires immediate attention and long-term planning, especially since research shows that Oklahoma's water resources are very sensitive to the length and severity of drought events.

Regarding surface resources, the impact of the 2011 drought was most significant on Lake Altus in southwest Oklahoma. In July 2011, water storage at the lake was 31,718 acre-feet, or about 70 percent less compared to July 2010 (104,571 acre-feet). Due to this significant decline, no water was released to the Lugert-Altus Irrigation District. Consequently, irrigated area decreased from about 44 percent of the total district area in 2010 to near zero in 2011.

Figure 1 demonstrates two satellite images of the Lugert-Altus Irrigation District, taken in July of 2010 and 2011. Reduction of water levels in Lake Altus (upper-center of the images) can be seen as the water surface area with dark blue color shows a significant decline, especially at the north end of the reservoir. Green color shapes south of the lake and around the city of Altus represent irrigated fields with healthy crops, which essentially disappeared in July 2011.

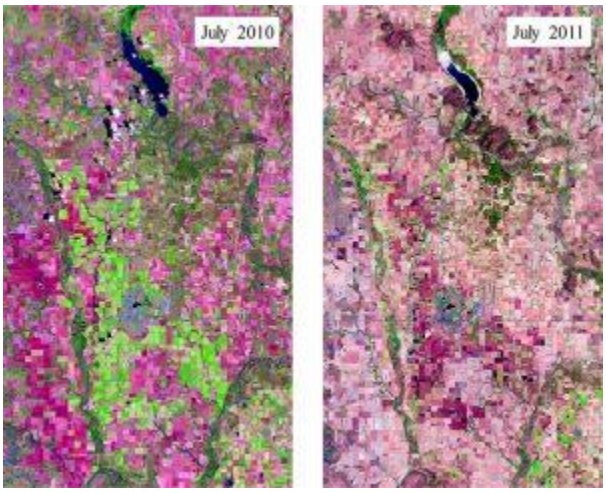


Figure 1. Water storage in Lake Altus and irrigated farmlands in the Lugert-Altus Irrigation District in July 2010 and 2011.

Water levels in Lake Altus had continued to decline during the remainder of the drought period (Figure 2), experiencing a total decrease of about 17 feet. By July 2014, the water storage in Lake Altus had dropped to 15,759 acre-feet, which was about 85 percent less than that in July 2010. After rainfall events in early 2015 and the end of the drought, water levels increased and even exceeded July 2010 levels.

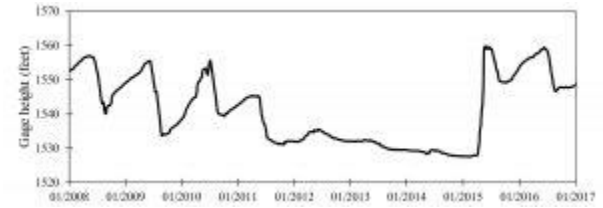


Figure 2. Fluctuation in water levels in Lake Altus between Jan. 2008 and Jan. 2017.

Similar to Lake Altus, reduction of water storage in other lakes was observed across the state. For example, Stanley Draper Lake near Oklahoma City lost about 38 percent of its storage capacity in July 2011 compared to July 2010. Water storage in Lake Ellsworth and Lake Lawtonka reduced by 41 percent and 15 percent in July 2011 compared to July 2010, respectively. The loss of water from lakes and reservoirs during the drought not only limited the water available for agriculture, but also impacted public and private water supplies, fish and wildlife habitats, recreational activities and many other uses with significant contribution to the state's economy.

Beside surface water sources, groundwater sources experience elevated stress during droughts. In Oklahoma, 73 percent of the irrigation water is supplied from groundwater resources, so groundwater plays a vital role in securing the sustainability of irrigated agriculture. The Ogallala aquifer, which is a major source of irrigation water in the northwest and Panhandle regions, has been diminishing during the past few decades. This has caused a significant decline in well capacities and an increase in pumping costs of water extracted from deeper levels. Research shows that groundwater is being pumped at higher rates during droughts, causing water levels to drop at a significantly faster rate compared to non-drought years.

Based on water level data collected from 42 monitoring wells across the Panhandle, water levels in the

Ogallala aquifer declined 19 feet from 2001 to 2017. Out of this total decline, 9 feet of the decline occurred during the recent drought of 2011 to 2015, meaning that 47 percent of total water level decline was experienced during just 25 percent of the study period (Figure 3). The average rate of decline during the drought period was 2.2 feet per year, or 2.75 times greater than the 0.8 feet-per-year average decline during non-drought years.

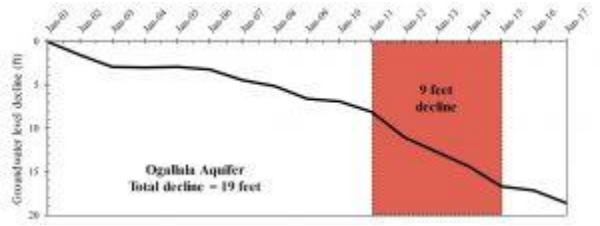


Figure 3. Groundwater level declines in the Ogallala aquifer.

Rush Springs is the second most important aquifer within the state and provides irrigation water to growers in Caddo, Custer, Washita and Grady counties. Similar to the Ogallala aquifer, the Rush Springs aquifer has experienced depletion during droughts. Based on the data from 12 monitoring wells, the water level in the Rush Springs aquifer dropped by 10 feet during a 16-year period (2001 to 2017). About 70 percent of that decline was observed in just four years (2011 to 2015) mainly due to drought conditions (Figure 4). The average rate of water level decline during drought years (2011 to 2015) was 1.8 feet per year, nine times the average decline rate in non-drought years (0.2 feet per year).

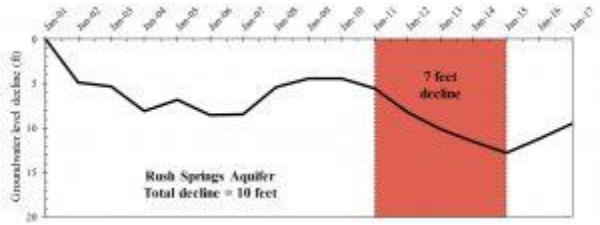


Figure 4. Groundwater level declines in the Rush Springs aquifer.

Unlike Ogallala, the Rush Springs aquifer showed increases in groundwater level after rainy periods in 2005, 2007 to 2009 and 2015 to 2017. This is because water in the Rush Springs aquifer is much closer to the surface than the Ogallala aquifer. For example, average groundwater depth in January 2017 was about 70 feet in the Rush Springs aquifer, compared to about 205 feet for the Ogallala aquifer. The Rush Springs aquifer is hydrologically connected to surface water resources and responds to precipitation, which makes it more resilient to long-term drought impacts. On the other hand, the Ogallala aquifer has a near-zero recharge rate and demonstrates no response to wet and rainy periods following drought. In this respect, the Ogallala is like a savings account that allows for withdrawals but no deposits.

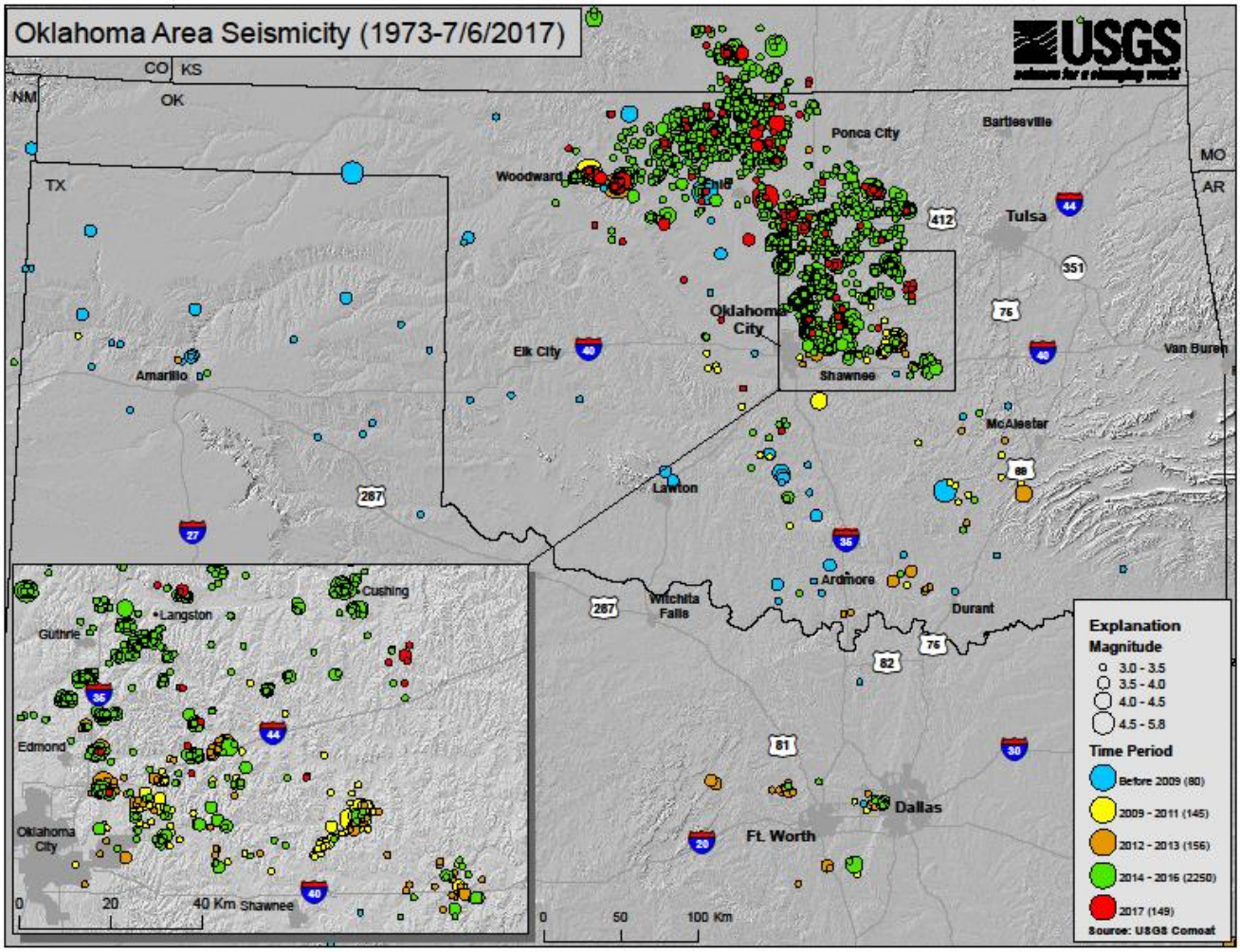
Source: http://factsheets.okstate.edu/documents/bae-1533-drought-and-its-impact-on-agricultural-water-resources-in-oklahoma/

3.3.3 Earthquake

Description: Earthquakes occur along fault zones throughout Oklahoma, as stress overcomes friction on faults those faults slip. The fault slip causes the ground to shake and the shaking leads to damage to infrastructure.

Location

The earthquake hazard for Oklahoma may occur throughout the state, with significant activity present in the central and north-central portions of the state.

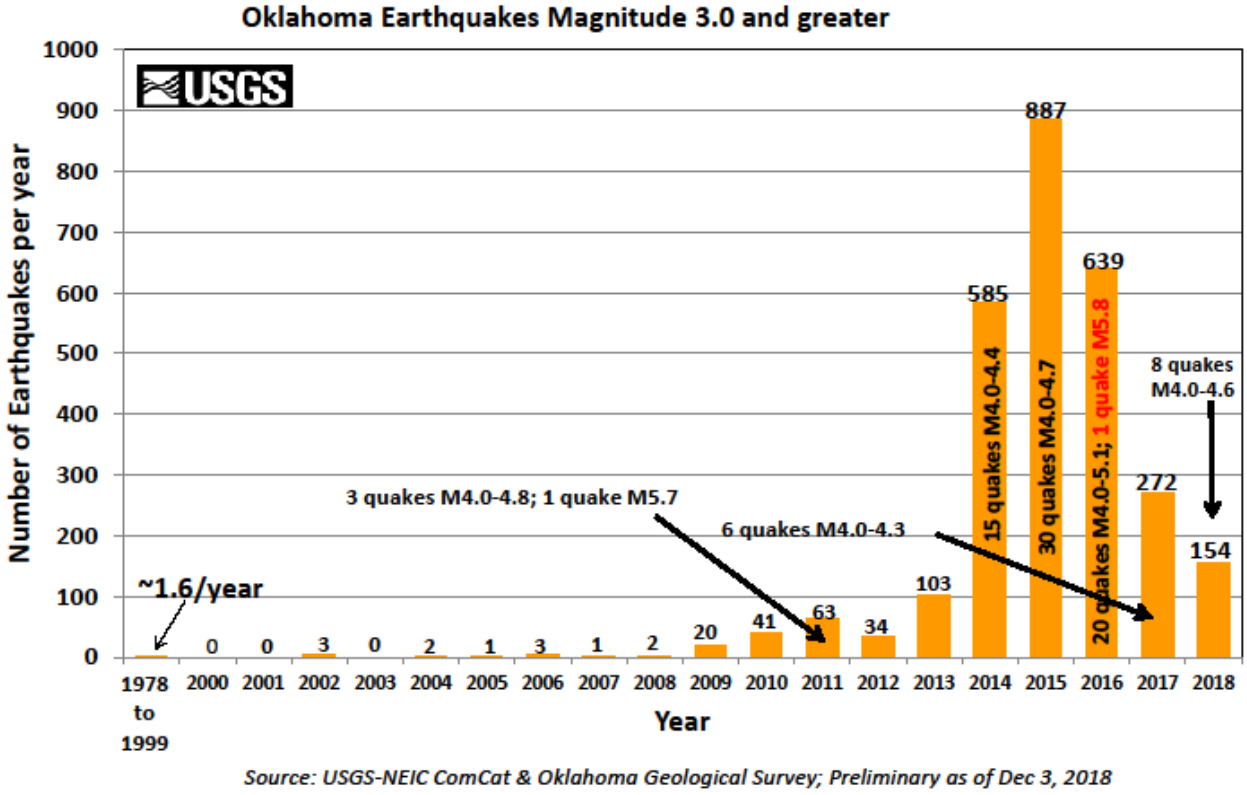


Source: USGS Earthquake Hazards Program.

Previous Occurrences:

Felt earthquakes

Several of the largest earthquakes in Oklahoma recorded history have occurred since 2009, including the November 2011 Mw 5.7 Prague earthquake, the February 2016 Mw 5.1 Fairview earthquake, the September 2016 Mw 5.8 Pawnee earthquake, and the November 2016 Mw 5.0 Cushing earthquake. Severe damage to several buildings during the Prague, Pawnee, and Cushing earthquakes were reported with some buildings condemned.



Source: USGS-NEIC ComCat & Oklahoma Geological Survey; Preliminary as of Dec 3, 2018

Top 10 Largest Earthquakes in Oklahoma Recorded History (by Magnitude)

Date	Name	Magnitude	County
September 3, 2016	Pawnee Earthquake	5.8	PAWNEE
November 6, 2011	Prague Earthquake	5.7	LINCOLN
April 9, 1952	El Reno Earthquake	5.5	CANADIAN
February 13, 2016	Fairview Earthquake	5.1	WOODS
November 7, 2016	Cushing Earthquake	5.0	PAYNE
November 5, 2011	Prague foreshock	4.8	LINCOLN
January 7, 2016	Fairview foreshock	4.8	WOODS
November 8, 2011	Prague aftershock	4.8	LINCOLN
November 19, 2015	Alfalfa County Earthquake	4.7	ALFALFA

Probability of Future Events and Risk Calculations: The USGS indicates that the chance for damage in an earthquake is low to moderate in the north-central portion of the state experiencing earthquakes, and thus a low to moderate likelihood of damage occurring.

The potential of future Earthquake events in most of Oklahoma is low because of slow geological movement. The most likely areas are in the counties shown on the map above. The danger of additional earthquakes in Oklahoma is **Possible.**

The CPRI for the Earthquake hazard for the State of Oklahoma is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(2 x .45)	+ (1 x .30)	+ (4 x .15)	+ (1 x .10)	= 1.9

Resources: United States Geological Survey (USGS) and Oklahoma Geological Survey (OGS)

Jurisdictions Most Vulnerable to Hazard and Potential Loss of Vulnerable Structures:

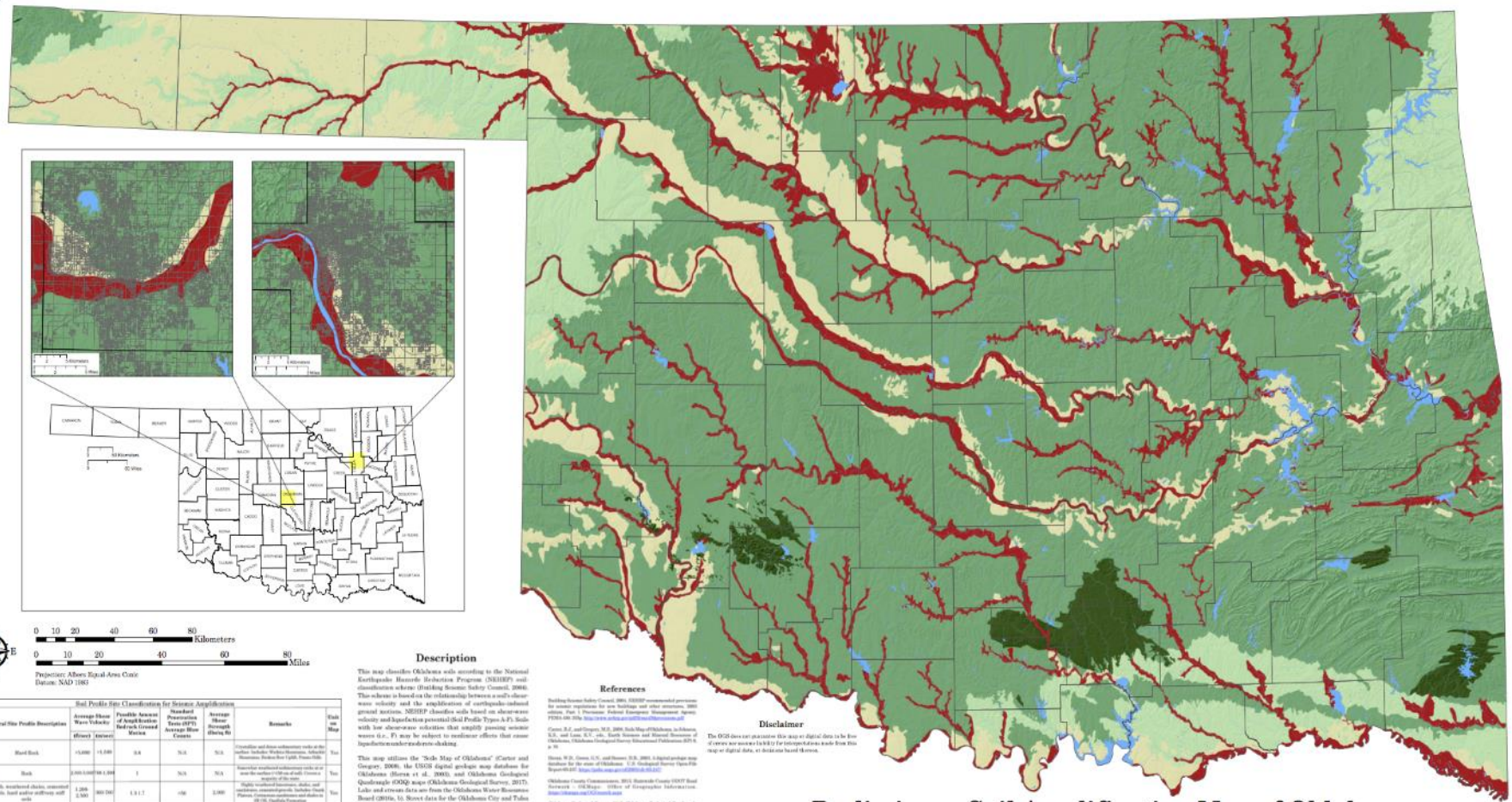
Those areas experiencing increased seismic activity and magnitudes of earthquakes in Oklahoma have been located in area predominantly from the central area north extending to the northwest, as indicated in the preceding location map. Within this area of concentration, the vulnerabilities are many fold. The Cities of Oklahoma City, Edmond, Guthrie, Stillwater and Enid are located within these areas, and the earthquake effects on an urban environment would be experienced. The three major interstates of I-40, I-35, and I-44 have a common junction in Oklahoma City, and impacts to those transportation routes would have regional and national impacts. Continued economic impacts would be felt nationwide due to the proximity of the City of Cushing in this area of concentration. Per the Tulsa World New Article from February 21, 2016; "*Cushing may be home to less than half of a percent of Oklahoma's total population, but the city with just fewer than 8,000 residents is arguably more important to the energy industry than any other point in North America. And if anything, the importance of the self-proclaimed "Pipeline Crossroads of the World" is only growing. The Cushing Interchange, just south of the city's downtown along Linwood*

Avenue, is one of the largest crude-oil marketing hubs in the U.S. Dotted with tanks that together could hold nearly 90 million barrels of crude oil, Cushing is the designated point of delivery for the commodity's New York Mercantile Exchange's futures contracts. It's also the price settlement point for the central United States' oil benchmark, the light sweet crude West Texas Intermediate."

Although this is the predominant location of the earthquakes in Oklahoma, there has been recorded earthquake activity outside of this area of concentration. Since the seismic risk to the built environment is associated with the underlying seismic hazard, OGS has identified soils statewide that may be susceptible to stronger shaking relative to other areas (OGS GM-41). In that study, they specifically identify which areas within these major metropolitan zones may be more susceptible to stronger shaking and subsequent damage. Further urban mapping would be required to better understand the soil structures that would be susceptible to strong shaking.

Oklahoma Geological Survey
Jeremy Boak, *Director*

Map GM-41
Preliminary Soil Amplification Map of Oklahoma



Projection: Albers Equal-Area Conic
Datum: NAD 1983

Soil Profile Site Classification for Seismic Amplification

Soil Profile Type	General Site Profile Description	Average Shear Wave Velocity (ft/sec)	Average Shear Wave Velocity (m/sec)	Possible Amount of Amplification Bedrock Ground Motion	Standard Penetration Tests (SPT) Average Blow Counts	Average Shear Strength (Su/sq ft)	Remarks	Unit on Map
A	Hard Rock	>5,000	>1,500	0.8	N/A	N/A	Crystalline and dense sedimentary rocks at the surface. Includes Wichita Mountains, Arbuckle Mountains, Ouachita Fold Belt, Prairie Delle	Yes
B	Rock	2,500-5,000	760-1,500	1	N/A	N/A	Somewhat weathered sedimentary rocks at or near the surface (<50 m of soil). Covers a majority of the state.	Yes
C	Rigid fill, weathered shales, cemented gravels, hard and/or stiff/very stiff soils	1,200-2,500	360-760	1.5-1.7	>50	2,000	Highly weathered limestones, shales, and sandstones, cemented gravels. Includes Ozark Plateau, Cretaceous sandstones and shales in SE OK, Ogallala Formation	Yes
D	Sands, silts, and/or stiff/very stiff clays, loess, gravels	600-1,200	180-360	1.5-2.4	15-50	1,000-2,000	Sand that is generally not saturated with water. Includes Panhandle loess and dunes, Quaternary terrace deposits	Yes
E	Soil profile with more than 10 ft (3m) of soft clay defined as soil with Plasticity Index > 20, water content > 40	<600	<180	1.2-1.5	<15	<1,000	Not mappable at this scale	No
F	Soils vulnerable to potential failure or collapse under seismic loading such as: liquefiable soils, quick and highly sensitive clays, collapsible, weakly cemented soils	N/A	N/A	Site Specific Investigation Required. Can be 1 to as high as 10 x	<15	<1,000	Any saturated or partially saturated sands. Includes Quaternary alluvium	Yes

Description

This map classifies Oklahoma soils according to the National Earthquake Hazards Reduction Program (NEHRP) soil-classification scheme (Building Seismic Safety Council, 2004). This scheme is based on the relationship between a soil's shear-wave velocity and the amplification of earthquake-induced ground motions. NEHRP classifies soils based on shear-wave velocity and liquefaction potential (Soil Profile Types A-F). Soils with low shear-wave velocities that amplify passing seismic waves (i.e., F) may be subject to nonlinear effects that cause liquefaction under moderate shaking.

This map utilizes the "Soils Map of Oklahoma" (Carter and Gregory, 2008), the USGS digital geologic map database for Oklahoma (Horton et al., 2000), and Oklahoma Geological Quadrangle (OGQ) maps (Oklahoma Geological Survey, 2017). Lake and stream data are from the Oklahoma Water Resources Board (2010a, b). Street data for the Oklahoma City and Tulsa Metro areas (inset) are from the Statewide ODOT Road Network (Oklahoma County Commissioners, 2013). The underlying DEM is 30m resolution (U.S. Geological Survey, 2016).

The map was produced and drafted in ArcGIS 10.4 and reviewed by David Brown and Ted Satterfield. Drafting assisted by Russell Standridge. It was funded by a grant through the Oklahoma Governor's office. This map is for informational purposes only and should not be used to determine liquefaction potential for specific sites. Further mapping and geotechnical measurements should be conducted in areas of concern.

References

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Oklahoma Water Resources Board, 2010b, OWRB – Major Streams – OWRB Surface Water Data: Oklahoma Water Resources Board, http://www.owrb.ok.gov/maps/PDF/owrbrivers_ST.html

U.S. Geological Survey, 2016, 1 Arc-second Digital Elevation Models (DEMs)—USGS National Map 3DEP Downloadable Data Collection: U.S. Geological Survey, https://nationalmap.gov/

Disclaimer

The OGS does not guarantee this map or digital data to be free of errors nor assumes liability for interpretations made from this map or digital data, or decisions based thereon.

Preliminary Soil Amplification Map of Oklahoma

According to the National Earthquake Hazard Reduction Program (NEHRP)

Brittany N. Pritchett, Jefferson C. Chang, Julie M. Chang, Neil H. Suneson, and Jacob I. Walter

2017

Scale 1:500,000

Soil Profile Site Classification for Seismic Amplification								
Soil Profile Type	**General Site Profile Description**	**Average Shear Wave Velocity**		**Possible Amount of Amplification Bedrock Ground Motion**	**Standard Penetration Tests (SPT) Average Blow Counts**	**Average Shear Strength (lbs/sq ft)**	**Remarks**	**Unit on Map**
		(ft/sec)	**(m/sec)**					
A	Hard Rock	>5,000	>1,500	0.8	N/A	N/A	Crystalline and dense sedimentary rocks at the surface. Includes: Wichita Mountains, Arbuckle Mountains, Broken Bow Uplift, Potato Hills	Yes
B	Rock	2,500-5,000	760-1,500	1	N/A	N/A	Somewhat weathered sedimentary rocks at or near the surface (<150 cm of soil). Covers a majority of the state	Yes
C	Regolith, weathered shales, cemented gravels, hard and/or stiff/very stiff soils	1,200-2,500	360-760	1.3-1.7	>50	2,000	Highly weathered limestones, shales, and sandstones, cemented gravels. Includes: Ozark Plateau, Cretaceous sandstones and shales in SE OK, Ogallala Formation	Yes
D	Sands, silts, and/or stiff/very stiff clays, loess, gravels	6,000-1,200	180-360	1.5-2.4	15-50	1,000-2,000	Sand chat is generally not saturated with water. Includes: Panhandle cover and loess, Quaternary terrace deposits	Yes
E	Soil profile with more than 10 ft (3m) of soft clay defined as soil with Plasticity Index > 30, water content > 40	<600	<180	1.2-3.5	<15	<1,000	Not mappable at this scale	No
F	Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible, weakly cemented soils	N/A	N/A	Site Specific Investigation should be conducted - can be < 1 to as high as 10 x	<15	<1,000	Any saturated or partially saturated sands. Includes: Quaternary alluvium	Yes

Figure caption: OK Geological Survey Geologic Map (GM) 41 depicting soil classification for possible amplification during strong earthquake shaking

Source: OK Geological Survey

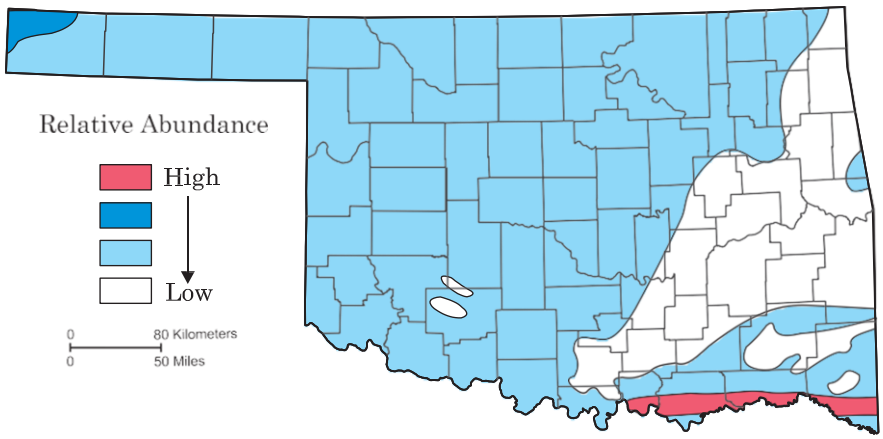
3.3.4 Soil Hazards-Expansive Soils/Soil Subsidence

Description: Expansive or swelling soils are soils that swell when subjected to moisture. These swelling soils typically contain clay minerals that attract and absorb water. Another category of expansive soil known as swelling bedrock contains a special type of mineral called clay stone.

Changes in soil volume present a hazard primarily to structures built on top of expansive soils. The most extensive damage occurs to highways and streets. The effect of expansive soil is most prevalent in regions of moderate to high precipitation, where prolonged periods of drought are followed by long periods of rainfall. Expansive soils can be recognized either by visual inspection in the field or by conducting laboratory analysis.

Principal geologic units in Oklahoma having high shrink-swell potential are Cretaceous shales that crop out in southern Oklahoma. Other shales that locally have moderately high shrink-swell potential are several Pennsylvanian units in the east and several Permian units in central Oklahoma

Location



Map shows relative abundance of expansive soils in Oklahoma (modified from Schuster, 1981).

Previous Occurrences: Oklahoma does not have disaster information on Expansive Soils because a catastrophic event has not been declared. This hazard develops gradually and is difficult to attribute dollar amounts to this hazard. No history is available because there are no reported losses which identify the presence of expansive soils as the direct cause.

Probability of Future Events and Risk Calculations:

The potential for serious Expansive Soil events in Oklahoma is **unlikely** but could occur under the right soil and weather conditions.

The CPRI for the Expansive Soils hazard for the State of Oklahoma is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(1x .45)	+ (1 x .30)	+ (1 x .15)	+ (4 x .10)	= 1.3

Resources: Oklahoma Department of Transportation (ODOT); U.S. Department of Agriculture, Natural Resources Conservation Services (NRCS)

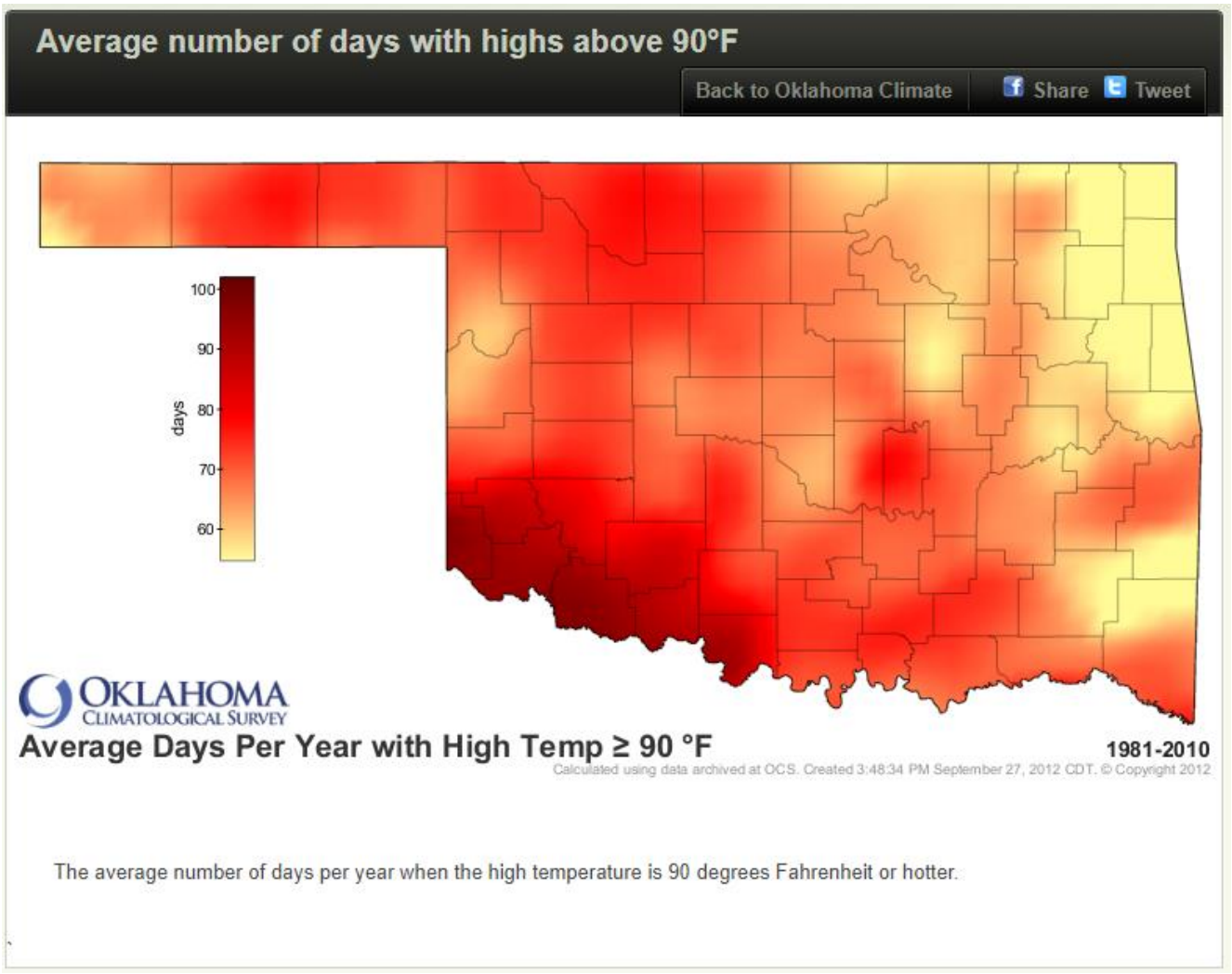
Jurisdictions Most Vulnerable to Hazard: The counties of McCurtain, Choctaw, Pushmataha, Bryan, Atoka, Marshall, Johnston, Love and Carter are the most susceptible to severe Expansive Soils while other counties could have isolated areas that may experience soil subsidence.

There is no recorded disaster declaration nor hazard events directly attributed to expansive soils nor soil subsidence in Oklahoma.

3.3.5 Extreme Heat

Description: There is no uniform set of attributes that define a heat wave, but events involving persistent hot extreme temperatures can produce negative impacts on ecosystems, the local economy, and human morbidity and mortality. The onset of a heat wave can be subtle and does not result in structural damage like other meteorological events. Extreme heat waves in urban areas can be particularly harmful due to the urban heat island environment in which they occur. Even in rural areas extreme temperatures can significantly damage crops, especially if too hot of temperatures occur during critical growth periods. Certainly hot temperatures dramatically increase the rate of evaporation off crop fields and farmers must irrigate at much higher rates to maintain growth. Meteorologists use different ways to describe heat waves, including daytime high and overnight low temperatures, duration, moisture, and relation to the climate variability observed at a given location.

Location


Average number of days with highs above 90°F
Back to Oklahoma Climate
Share
Tweet
100
90
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60
days
OKLAHOMA
CLIMATOLOGICAL SURVEY
Average Days Per Year with High Temp ≥ 90 °F
1981-2010
Calculated using data archived at OCS. Created 3:48:34 PM September 27, 2012 CDT. © Copyright 2012
The average number of days per year when the high temperature is 90 degrees Fahrenheit or hotter.

Previous Occurrences

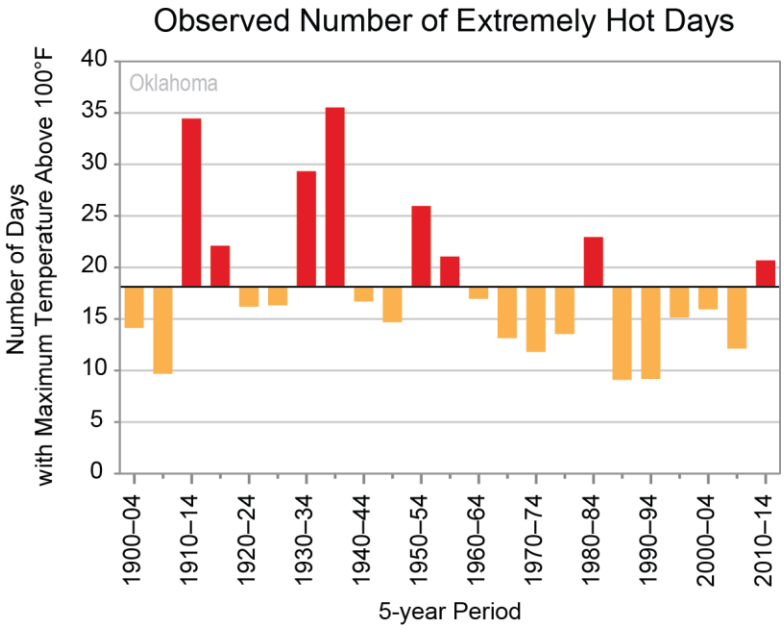

Figure 3: The observed annual average number of (a) extremely hot days (days with maximum temperature above 100°F), Source: CICS-NC and NOAA NCEI.

Significant Extreme Heat Occurrences

(Information provided by National Weather Service, Oklahoma Climatological Survey and the National Climate Data Center)

Summer 2012

Oklahoma experienced a very hot summer in 2012, along with much of the middle of the country do to a persistent ridge of high pressure and severe drought conditions. Extremely hot temperatures and high humidity combined to produce dangerously hot weather conditions at times across Oklahoma. Daily heat index values climbed into the 105 to 115 degree range with little relief occurring at night as temperatures only fell into the upper-70s to mid-80s. August 2, 2012 was the fourth hottest day in Oklahoma history, only behind historic days in 1936, with a statewide average temperature of 94.9 F. Oklahoma City tied its all-time record high temperature of 113 F August 3. More than 88 people were reported as treated at hospitals for heat illness.

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Summer 2011
An abnormally strong ridge of high pressure over the south central US dominated the summer and severe drought resulted in prolonged hot temperatures. High temperatures routinely climbed over 100 under mostly clear skies. This heat combined at times with fairly high relative humidity values resulted in afternoon heat index values, or apparent temperatures, in the 105 to 110 degree range. Very little relief was realized during the overnight period as temperatures only fell into the mid to upper 70s. Oklahoma experienced the hottest summer on record for the state. The statewide average high temperature over the entire summer was 100.5 F. Over 296 people were hospitalized for heat illness and the Oklahoma Office of the Chief Medical Examiner reported 33 heat related deaths in the state.

Mid July - August 2010
Temperatures were above normal with daytime readings regularly reaching the upper 90s to near 102 and overnight temperatures only falling into the mid to upper 70s. Due in part to heavy rains in June and early July, very humid conditions resulted in afternoon heat index values between 105 and 115 degrees. As Oklahoma slowly dried out through July, the high heat index values were traded with higher ambient temperatures. At least 127 people were treated for heat-related illness.

July – August 2008
A prolonged period of excessive heat occurred across much of central and eastern Oklahoma during the early part of August. Daytime high temperatures reached the 100 to 105 degree range, daily maximum heat index values reached the 105 to 115 degree range, and morning low temperatures only fell into the upper 70s to lower 80s. Two direct fatalities resulted from this heat in Tulsa County and dozens of others were treated for the heat by EMSA. One man died due to a heat-related illness while driving a tractor six miles north of Lone Wolf. Another person hospitalized after collapsing from heat exhaustion in Oklahoma City. There were also at least 47 hospitalizations for heat illness.

August 2007
Temperatures were in the upper 90s and heat indices were around 103. A 47 year old railroad worker collapsed of heat exhaustion after working all day in the summer heat. The man died shortly after being transported to a hospital. A strong ridge of high pressure developed over the south central United States resulting in abundant sunshine and hot temperatures. The humidity was also high as a result of the spring rains that continued well into the summer. The combination of hot temperatures and high humidity resulted in daytime heat index values from 105 to 113 degrees across much of eastern Oklahoma. Overnight temperatures remained above 75 degrees, which didn't allow much relief from the heat. Two hundred other people were treated by EMSA in Tulsa for heat related illnesses. Many of those victims were in attendance at the PGA Championship.

July - August 2006

Temperatures reached triple digits across Okla. Starting in mid-July and continued through the end of the month. Many locations at times reached 105 degrees of greater with higher heat index

values. Overnight lows remained warm for much of this time also with most locations only falling to 75+ degrees. The heat caused 24 reported fatalities and at least 100 hospitalizations during this time period. Many fatalities occurred in homes that did not have fans or working air conditioners. Paramedic services also made numerous calls for heat-related illnesses during this time. The heat also caused a portion of Interstate 44, on the W side of Oklahoma City, to buckle. The heat also caused a strain on several power grids causing local authorities to ask people to minimize the consumption of power during the hottest parts of the day to prevent brown outs.

Probability of Future Events and Risk Calculations

The CPRI for the High Wind hazard for the State of Oklahoma is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(2 x .45)	+ (1 x .30)	+ (3 x .15)	+ (2 x .10)	= 2.95

Jurisdictions Most Vulnerable to Hazard

The entire State of Oklahoma may experience extreme heat. Based on data from the Oklahoma Climatological Survey those jurisdictions in Southwest Oklahoma will experience 90 to 100 days of air temperature exceeding 90°, with a declining gradient that extends from Southwest Oklahoma to Northeast Oklahoma, which experiences 60 days or less of 90° or greater in air temperature.

3.3.6 Flooding

Description: A flood is a natural event for rivers and streams. River flooding is when a river exceeds the channel carrying capacity and overflows onto the surrounding floodplain. The amount of flooding is usually a function of the amount of precipitation in an area, the amount of time it takes for rainfall to accumulate, previous saturation of local soils, and the terrain around the river system.

Flash flooding occurs when the precipitation rate becomes so large that local waterway drainage cannot discharge the runoff. It can develop very quickly during or immediately after a nearby heavy rainfall. The primary threat from flash flooding is often to human life and safety, while the slower onset and more widespread nature of river flooding causes the primary threat to be economic and property damage.

Several factors determine the severity of floods, including rainfall intensity and duration. Below is a table identifying the contributing factors to flash-flooding hazard and vulnerability in Oklahoma.

Factor	Effect
Precipitation Rate	As the rate of precipitation increases, so does its ability to outpace watershed drainage. *This is the dominant factor in flash flooding events, and can overwhelm any or all of the following factors.*
Training Echoes	Storm cells that follow each other can repeatedly deposit large amounts of water on the same watershed, overwhelming its ability to handle runoff.
Slope of Watershed	Steeper topography (hills, canyons, etc.) will move runoff into waterways more quickly, resulting in a quicker response to precipitation.
Shape of Watershed	Watersheds that are linear in nature tend to collect runoff in a manner that the runoff arrives downstream at different times. In watersheds that are more square or circular shaped, runoff tends to arrive downstream within a shorter timeframe, intensifying the flooding effect. This factor becomes more significant with larger watersheds.
Saturation of Soils	Saturated or near-saturated soils can greatly reduce the rate at which water can soak into the ground. This can increase runoff dramatically independently of precipitation amounts.
Hardened Soils	Extremely dry soils can develop a "crust" or resistance to infiltration. This is especially true in areas of recent wildfire, where plant oils or resins may cause the soil to be even more water-resistant.
Urbanization	The urban environment usually intensifies the response to heavy precipitation. The two dominant urban factors are: 1) increased impervious surface coverage, which prevents infiltration and dramatically increases runoff; and 2) Urban systems are designed to remove water from streets and byways as quickly as possible. This accelerates the natural response to precipitation by placing runoff in waterways much more quickly.

Location: The conditions that lead to flash flooding can happen anywhere in Oklahoma, during any season, and at any time of day. Riverine flooding may occur anywhere in Oklahoma near a river, creek or stream. Additional flood risk information is being updated and revised for communities where flood hazards are currently unmapped or un-modernized. Maps of flood risk areas is located in Appendix C.

Previous Occurrences: Localized and widespread flooding is a common occurrence in Oklahoma, with 372 events being reported between 01/01/2007 and 01/01/2018.

Number of County/Zone areas affected:	52
Number of Days with Event:	127
Number of Days with Event and Death:	6
Number of Days with Event and Death or Injury:	6
Number of Days with Event and Property Damage:	18
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Since 2010, Oklahoma has experienced (8) federally declared disasters that have had flooding as an element of the disaster.

Oklahoma Severe Storms, Tornadoes, Straight-line Winds, and Flooding (DR-4324)

Incident period: May 16, 2017 to May 20, 2017

Major Disaster Declaration declared on July 25, 2017

Oklahoma Tornadoes, Severe Storms, and Flooding (DR-1272)

Incident period: May 03, 1999 to May 04, 1999

Major Disaster Declaration declared on May 04, 1999

Oklahoma Severe Storms, Tornadoes, and Flooding (DR-4315)

Incident period: April 28, 2017 to May 02, 2017

Major Disaster Declaration declared on May 26, 2017

Oklahoma Severe Storms and Flooding (DR-4274)

Incident period: June 11, 2016 to June 13, 2016

Major Disaster Declaration declared on July 15, 2016

Oklahoma Severe Winter Storms and Flooding (DR-4256)

Incident period: December 26, 2015 to January 05, 2016

Major Disaster Declaration declared on February 10, 2016

Oklahoma Severe Winter Storms and Flooding (DR-4247)

Incident period: November 27, 2015 to November 29, 2015

Major Disaster Declaration declared on December 29, 2015

Oklahoma Severe Storms, Tornadoes, Straight-line Winds, and Flooding (DR-4222)

Incident period: May 05, 2015 to June 22, 2015

Major Disaster Declaration declared on May 26, 2015

Oklahoma Severe Storms, Tornadoes, and Straight-Line Winds (DR-1917)

Incident period: May 10, 2010 to May 13, 2010

Major Disaster Declaration declared on May 24, 2010

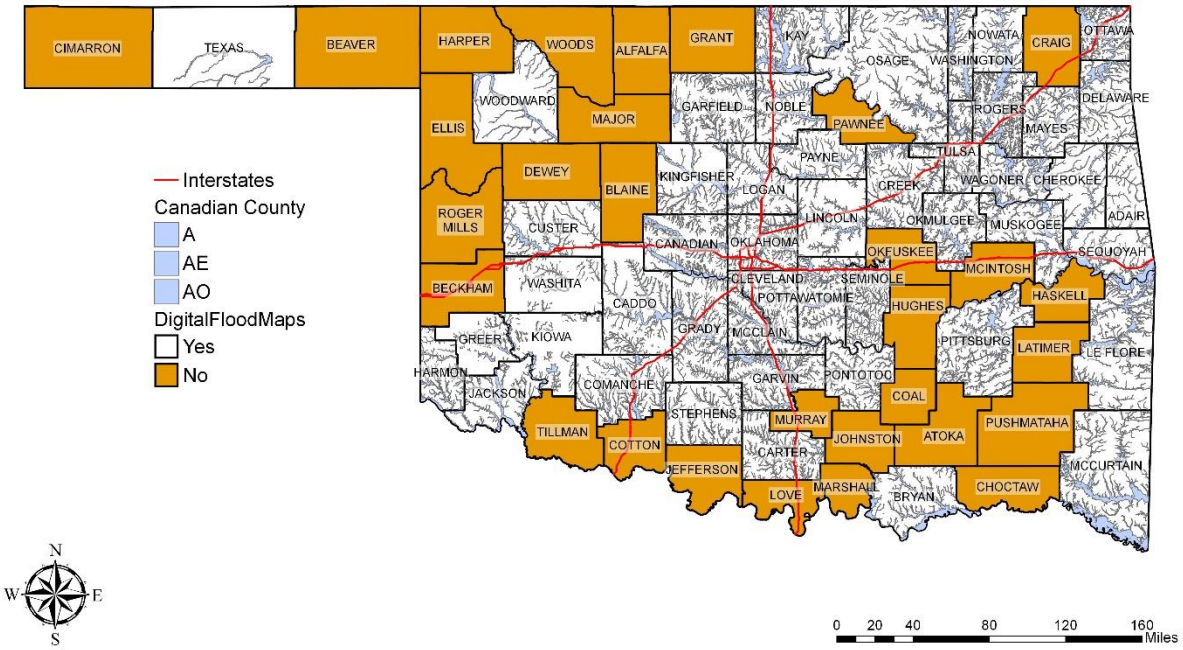
Probability of Future Events and Risk Calculations: The probability remains **Highly Likely** for future flood events occurring anywhere in Oklahoma.

Calculated Priority Risk Index (CPRI)

The CPRI for the Flooding hazard for the State of Oklahoma is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(4 x .45)	+ (4 x .30)	+ (3 x .15)	+ (3 x .10)	= 3.75

Jurisdictions Most Vulnerable to Hazard: Areas of increased flood risk occur in all 77 counties in Oklahoma. Through the Flood Map Modernization (Map Mod), a multiyear Presidential initiative funded by Congress from fiscal year (FY) 2003 to FY2008, improved and updated the nation's flood maps and provided 92 percent of the nation's population with digital Flood Insurance Rate Maps. Currently, 47 of the 77 counties in Oklahoma were modernized with Digital Flood Insurance Rate Maps (dFIRM), with the last dFIRM adopted in 2015. The remaining 30 counties that were not modernized still have a identified flood risk, and these areas are identified in Paper FIRM's that may be downloaded or accessed through local government agencies. Additional maps of the state's flood risk area has been included in Appendix C.

Oklahoma Flood Risk Area Map



As part of the OWRB CTP program, the state has identified the Top 20 HUC Watersheds in Oklahoma for flood risk through the "RiskMAP" Prioritization and Multiyear Sequencing Decision Support System". This system is the ranking device deployed by FEMA's Region VI to enable the comparison of watersheds based on normalized factors. The process of normalization was employed to enable the fair comparison when population and areas are varying among watersheds. The following provides a summary of the criteria employed by this ranking system:

Region VI RiskMAP Prioritization & Multiyear Sequencing Decision Support System
Incorporated Decision Factors

Factor	Sub- Factor Weight	Sub-Factor Name
RISK	40%	Average Annualized Loss (AAL)
	25%	Population
	10%	High Hazard Dams (HHDS) Presence
	25%	Percent Impervious
NEEDS	53%	Non-NVUE Miles
	5%	Percentage Urban Change
	11%	Topo Coverage
	5%	Unknown TBA Topo Coverage
	5%	LOMC Rank
	21%	Project Footprint
ACTION	19%	Mitigation Plan
	10%	Participation
	0%	Violations
	24%	Community Ranking System (CRS)
	5%	Disaster Declarations
	10%	FIA
	0%	Grants
	19%	Stormwater Utilities
	10%	Congressional Hot Spots
	5%	HHD w/ EAP RANK

The table below of the Top 20 HUC 8 watersheds that have been ranked according to risk using multiple criteria as indicated in the preceding table based on 20 separate factors and normalized. See Appendix D for watershed locations in Oklahoma.

HUC 08 Name	HUC 8	Ranking Criteria			
		Trifecta (Top 10)	20 Factors (Top 10)	Region VI Tool	OK Tool
Bird	11070107	10	7	7	5
Black Bear-Red Rock	11060006	0	8	6	19
Blue	11140102	0	0	18	23
Cache	11130202	0	0	20	9
Caney	11070106	7	6	23	24
Clear Boggy	11140104	0	0	13	26
Deep Fork	11100303	0	0	17	10
Dirty-Greenleaf	11110102	0	0	30	14
Farmers-Mud	11130201	0	0	12	36
Lake O' The Cherokees	11070206	0	0	37	13
Lake Texoma	11130210	0	0	16	41
Little	11090203	0	0	3	7
Lower Beaver	11100201	0	0	N/A	40
Lower Canadian	11090204	0	9	11	16
Lower Canadian-Deer	11090201	0	0	19	35
Lower Canadian-Walnut	11090202	3	5	4	3
Lower Cimarron	11050003	0	0	14	18
Lower Cimarron-Eagle Chief	11050001	0	0	40	38
Lower Cimarron-Skeleton	11050002	2	1	2	4
Lower Neosho	11070209	5	2	5	15
Lower North Canadian	11100302	1	3	15	2
Lower North Fork Red	11120303	0	0	28	11
Lower Salt Fork Arkansas	11060004	0	10	10	28
Lower Verdigris	11070105	0	0	24	20
Lower Washita	11130304	0	0	33	17
Lower Wolf	11100203	0	0	39	43
Middle Beaver	11100102	0	0	42	39
Middle Washita	11130303	4	4	9	8
Mountain Fork	11140108	0	0	N/A	37
Northern Beaver	11130208	0	0	8	21
Polecat-Snake	11110101	0	0	22	12
Poteau	11110105	9	0	27	22
Upper Beaver	11100101	0	0	41	42

3.3.7 Severe Storms (Hail, Lightning)

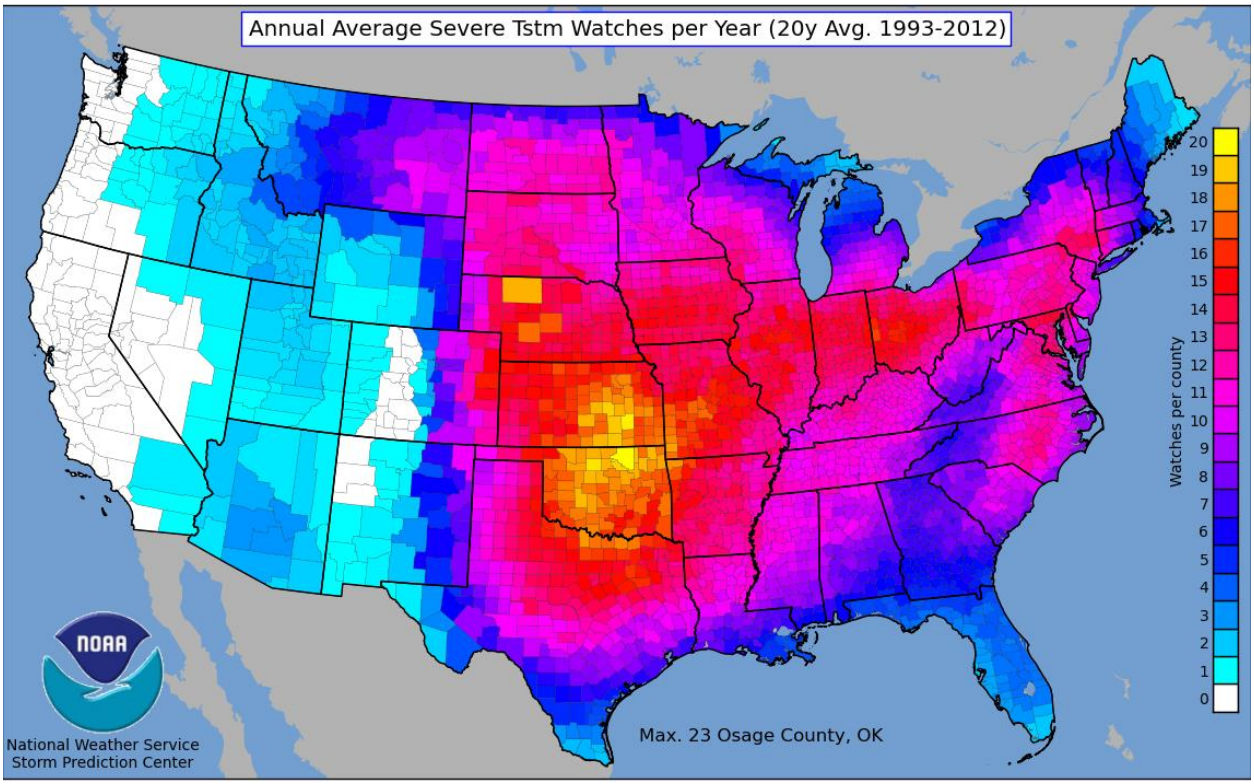
Description: Thunderstorms are common occurrences in the Midwest and Central United States. Each year, an estimated 100,000 thunderstorms occur in the United States. Of those, about 10 percent are classified as severe thunderstorms - those that produce hail at least three-quarters of an inch in diameter, have winds of 58 miles per hour or higher, or produce a tornado.

All thunderstorms are dangerous and can be associated with a number of hazards. Heavy rains can lead to flash flooding events – one of the primary causes of death associated with thunderstorms. Lightning, which is produced by every thunderstorm, causes an average of 80 fatalities and 300 injuries each year. Lightning can also start building fires, damage electrical equipment, electrocute humans and livestock, and is the leading cause of farm fires. High winds generated by thunderstorm can cause damage to homes, overturn vehicles, uproot or damage trees, or blow down utility poles causing wide spread power outages. Hail causes billions of dollars in damage to crops and property each year and can injure people or animals left outdoors.

Hail is a form of solid precipitation that consists of balls or irregular lumps of ice, which are individually called hailstones. Large hailstones greater than an inch in diameter (quarter size), can result from a severe thunderstorm and require a very powerful updraft to form. Most large hail is the product of supercell thunderstorms, which have a sustained rotating updraft that moves growing hailstones a long distance through the height of the cloud before falling to the ground. Unlike ice pellets, hailstones are layered and can be irregular and clumped together. Hail is composed of transparent ice or alternating layers of transparent and translucent ice, which are deposited upon the hailstone by alternating wet or dry deposition processes as it travels upward through the cloud until it exits the updraft and falls to the ground.

Lightning is a natural phenomenon which develops when the upper atmosphere becomes unstable due to the convergence of a warm, solar heated, vertical air column on the cooler upper air mass. These rising air currents carry water vapor which, on meeting the cooler air, usually condense, giving rise to convective storm activity. Pressure and temperature are such that the vertical air movement becomes self-sustaining, forming the basis of a cumulonimbus cloud formation with its center core capable of rising to more than 45,000 feet meters. To be capable of generating lightning, the cloud needs to be 3 to 4 km deep. The taller the cloud, the more frequent the lightning. The center column of the cumulonimbus can have updrafts exceeding 120 km/hr., creating intense turbulence with violent wind shears and consequential danger to aircraft. This same updraft gives rise to an electric charge separation which ultimately leads to the lightning flash distribution within a fully developed thunder cloud

Location



Previous Occurrences:

Year	Number of Severe Thunderstorm Watches issued
2018	**55**
2017	**59**
2016	**61**
2015	**52**
2014	**42**
2013	**48**

Source: NWS Storm Prediction Center

317 Severe Thunderstorm events were reported between January 2013 through December 2018 according the NOAA NWS Storm Prediction Center.

Probability of Future Events and Risk Calculations

The CPRI for Severe Storms for the State of Oklahoma is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(4 x .45)	+ (2 x .30)	+ (4 x .15)	+ (2 x .10)	= 3.1

Jurisdictions Most Vulnerable to Hazard

All 77 Counties in Oklahoma can experience a range of Severe Thunderstorms watches from a minimum of 10 to greater than 20 a year, with Osage County experiencing 23 a year on average. The NWS definition of a Severe Thunderstorm watch is as follows;

Severe Thunderstorm Watch

A Severe Thunderstorm Watch is issued when severe thunderstorms are possible in and near the watch area. It does not mean that they will occur. It only means they are possible.

Severe thunderstorms are defined as follows:

1) Winds of 58 mph or higher

AND/OR

2) Hail 1 inch in diameter or larger.

3.3.8 High Winds

Description: Wind is defined as the movement of air relative to the earth's surface. High winds can result from thunderstorms, strong cold front passages, or gradient winds between high and low pressure moving across Oklahoma. High winds, sometimes referred to as "straight-line" winds, are speeds reaching 58 mph or greater, either sustaining or gusting. In April of 2010 NCDC has further defined high winds into three categories for recording purposes.

High Wind:

- Sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer or winds (sustained or gusts) of 50 knots (58 mph) for any duration (or otherwise locally/regionally defined), on a widespread or localized basis. In some mountainous areas, the above numerical values are 43 knots (50 mph) and 65 knots (75 mph), respectively.

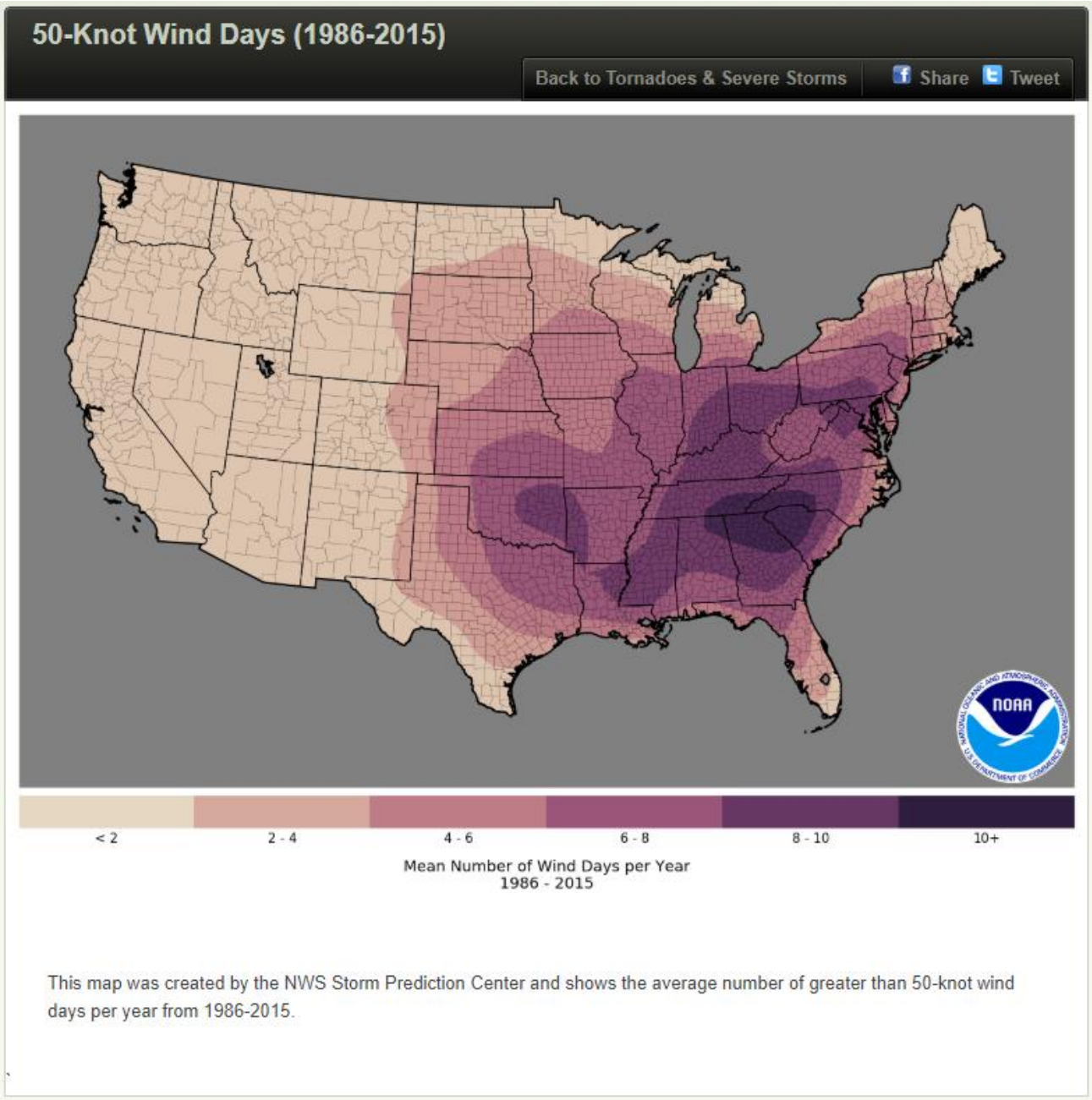
Strong Wind:

- Non-convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph), resulting in a fatality, injury, or damage. Consistent with regional guidelines, mountain states may have higher criteria. A peak wind gust (estimated or measured) or maximum sustained wind will be entered.

Thunderstorm Wind:

- Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 50 knots (58 mph), or winds of any speed (non-severe thunderstorm winds below 50 knots) producing a fatality, injury, or damage. Maximum sustained winds or wind gusts (measured or estimated) equal to or greater than 50 knots (58 mph) will always be entered.

- **Location**


50-Knot Wind Days (1986-2015)
Back to Tornadoes & Severe Storms
Share
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NOAA
< 2
2 - 4
4 - 6
6 - 8
8 - 10
10+
Mean Number of Wind Days per Year
1986 - 2015
This map was created by the NWS Storm Prediction Center and shows the average number of greater than 50-knot wind days per year from 1986-2015.

Previous Occurrences: 28 High Wind events were reported between 06/01/2013 and 06/30/2018 (1856 days)

Summary Info:

Number of County/Zone areas affected:	30
Number of Days with Event:	39
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	0
Number of Days with Event and Property Damage:	6
Number of Days with Event and Crop Damage:	0

Probability of Future Events and Risk Calculations

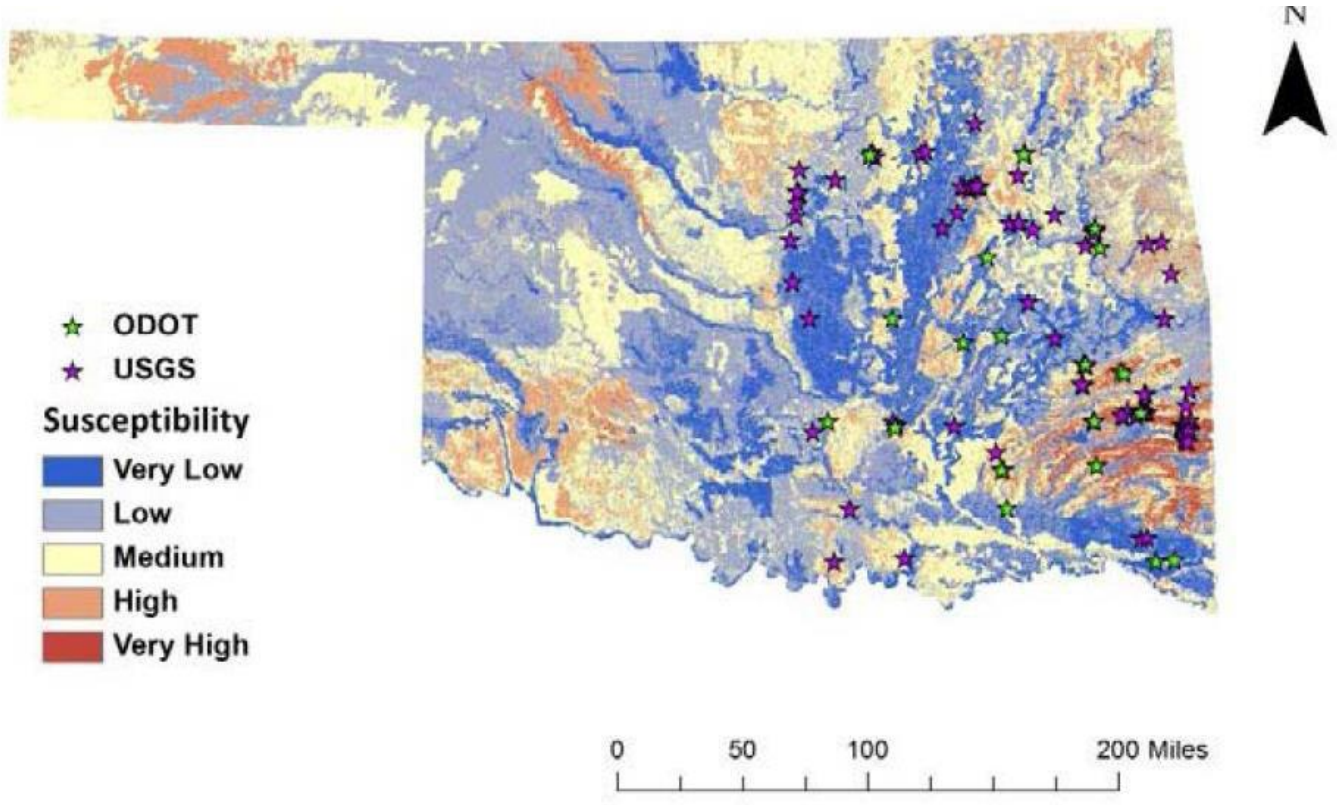
The CPRI for the High Wind hazard for the State of Oklahoma is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(2 x .45)	+ (1 x .30)	+ (3 x .15)	+ (2 x .10)	= 2.95

Damaging winds in Oklahoma are associated with severe thunderstorms and the passage of frontal boundaries. More favorable environments for severe thunderstorms are expected and increases in severe wind occurrences are projected. Climate models project an increase in the frequency and intensity of severe thunderstorms over the Southern Great Plains, especially during the peak storm season (March, April, May). Uncertainty remains, however, in the assumption that the favorable environments will reach their potential of producing damaging winds (Kossin et al. 2017).

Jurisdictions Most Vulnerable to Hazard: Those jurisdictions in the panhandle and western portion of Oklahoma may experience less than 2 days per year of a wind event that exceeds 50 knots to east central portion of the state experiencing 8-10 days a year that exceed 50 knots.

3.3.9 Landslides

Description: The term **landslide** refers to several forms of mass wasting such as rock falls, slope failures, mudflows, and debris flows. Although the action of gravity is the primary driving force for a landslide to occur, there are other contributing factors affecting slope stability. Typically, pre-conditional factors build up specific surface or sub-surface conditions that make a slope prone to failure, whereas the actual landslide often requires a trigger before being released.



Landslide Susceptibility Map of Oklahoma; the landslide susceptibility map of Oklahoma using the combined soil texture layer and new rating values. The highest risk area is at southeastern corner of this state.

Previous Occurrences: Oklahoma does not have disaster information on specific landslide occurrences because a disaster event has not been declared. There have been minor cases of rockslides and landslides that have occurred in Oklahoma. In June 2015, the I-35 Interstate was closed due to a rock fall that impacted the northbound lanes. Based on ODOT Report FHWA-OK-14-06 Real Time Monitoring of Slope Stability in Eastern Oklahoma, there are 80 historic landslide locations identified by the USGS and 23 current landslides identified in Oklahoma. These landslide area effected primarily state highway locations, and were limited in size and scope. Currently, there is no damage history to structures is available because there are no reported losses which identify landslides as the direct cause. There have been impacts to transportation corridors as identified by ODOT.

Probability of Future Events:

The CPRI for Landslide Hazard for the State of Oklahoma is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(1 x .45)	+ (1 x .30)	+ (1 x .15)	+ (4 x .10)	= 1.30

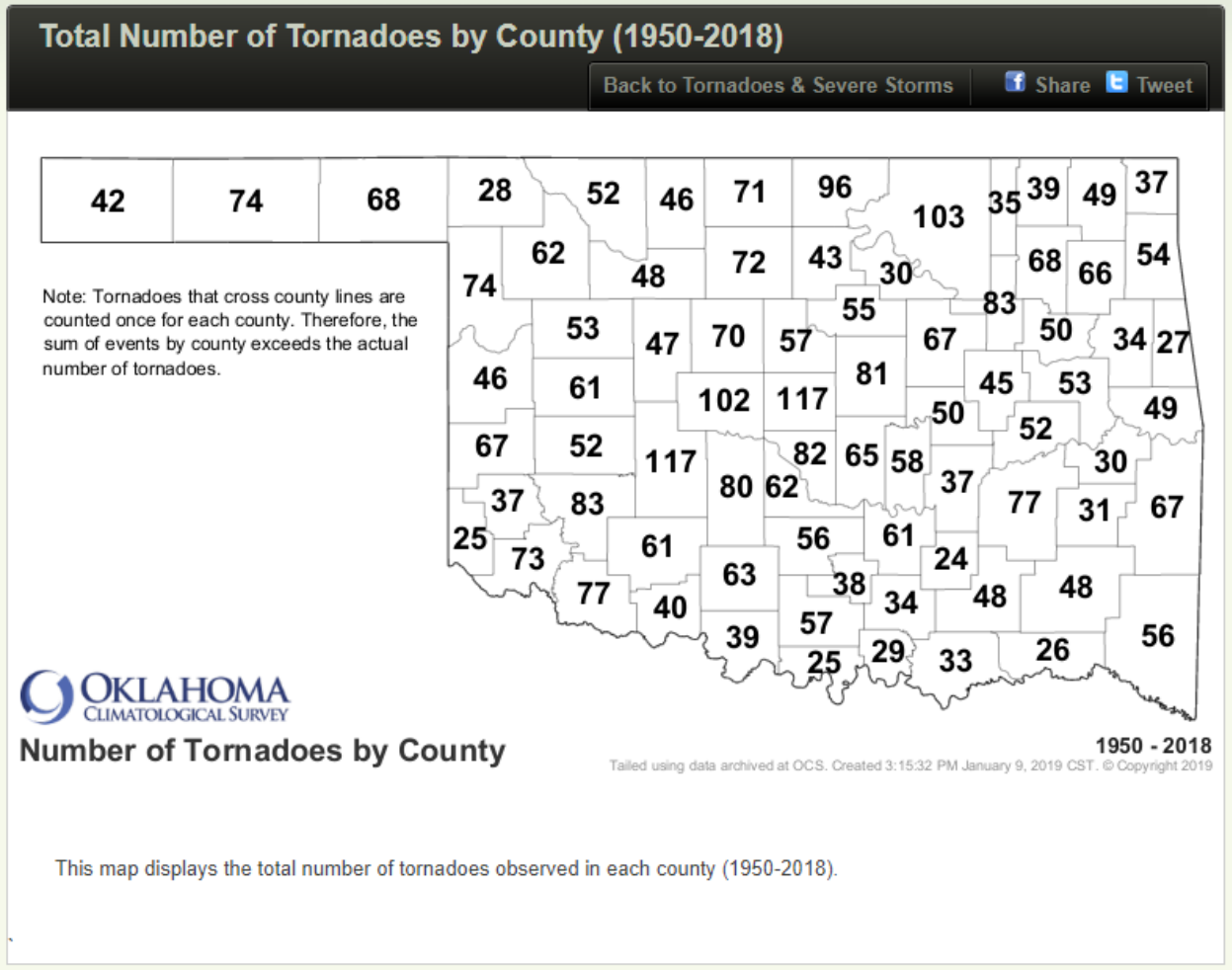
Jurisdictions Most Vulnerable to Hazard: Landslide Hazards in the State of Oklahoma have been located in specific areas, and are dependent on geological formations and influenced by weather related factors such as periodicity of precipitation. These locations primarily occur in Eastern Oklahoma, which has the many of the requisite factors such as precipitation, slope instability and geological formations that are factors in a landslide event.

3.3.10 Tornado

Description: A tornado is defined as a violently rotating column of air that reaches from the bottom of a cumulonimbus cloud to the ground. Tornadoes are found in severe thunderstorms, but not all severe thunderstorms will contain tornadoes. Tornadoes can appear in a variety of shapes and sizes ranging from thin ropelike circulations to large wedge shapes greater than one mile in width. However, a tornado's size is not necessarily related to its wind speed. The strongest tornadoes can have wind speeds in excess of 200mph. Over 80% of Oklahoma tornadoes have struck between 3PM and 9PM, but can still occur anytime. Spring is the peak season for Oklahoma tornadoes, but they can form during any season when the necessary atmospheric conditions of wind shear, lift, instability, and moisture are present.

Location

The entire State of Oklahoma is at risk for tornadoes, with a range of Choctaw Co observing 26 tornadic events to Osage Co observing 103 tornadic events.



Previous Occurrences:

Since 2010, Oklahoma has experienced (9) federally declared disasters that have had tornadic event as an element of the disaster.

Oklahoma Severe Storms, Tornadoes, Straight-line Winds, and Flooding (DR-4324)

Incident period: May 16, 2017 to May 20, 2017

Major Disaster Declaration declared on July 25, 2017

Oklahoma Severe Storms, Tornadoes, and Flooding (DR-4315)

Incident period: April 28, 2017 to May 02, 2017

Major Disaster Declaration declared on May 26, 2017

Oklahoma Severe Storms, Tornadoes, Straight-line Winds, and Flooding (DR-4222)

Incident period: May 05, 2015 to June 22, 2015

Major Disaster Declaration declared on May 26, 2015

Oklahoma Severe Storms and Tornadoes (DR-4117)

Incident period: May 18, 2013 to June 02, 2013

Major Disaster Declaration declared on May 20, 2013

Oklahoma Severe Storms, Tornadoes, Straight-line Winds, and Flooding (DR-4064)

Incident period: April 28, 2012 to May 01, 2012

Major Disaster Declaration declared on June 14, 2012

Oklahoma Severe Storms, Tornadoes, Straight-line Winds, and Flooding (DR-1989)

Incident period: May 22, 2011 to May 25, 2011

Major Disaster Declaration declared on June 06, 2011

Oklahoma Severe Storms, Tornadoes, and Straight-Line Winds (DR-1970)

Incident period: April 14, 2011

Major Disaster Declaration declared on April 22, 2011

Oklahoma Severe Storms, Tornadoes, Straight-line Winds, and Flooding (DR-1926)

Incident period: June 13, 2010 to June 15, 2010

Major Disaster Declaration declared on July 26, 2010

Oklahoma Severe Storms, Tornadoes, and Straight-Line Winds (DR-1917)

Incident period: May 10, 2010 to May 13, 2010

Major Disaster Declaration declared on May 24, 2010

Additionally, there has been 159 Tornadic events of an EF2 or greater were reported between 06/01/2008 and 06/30/2018 according to the National Weather Service.

Summary Info:

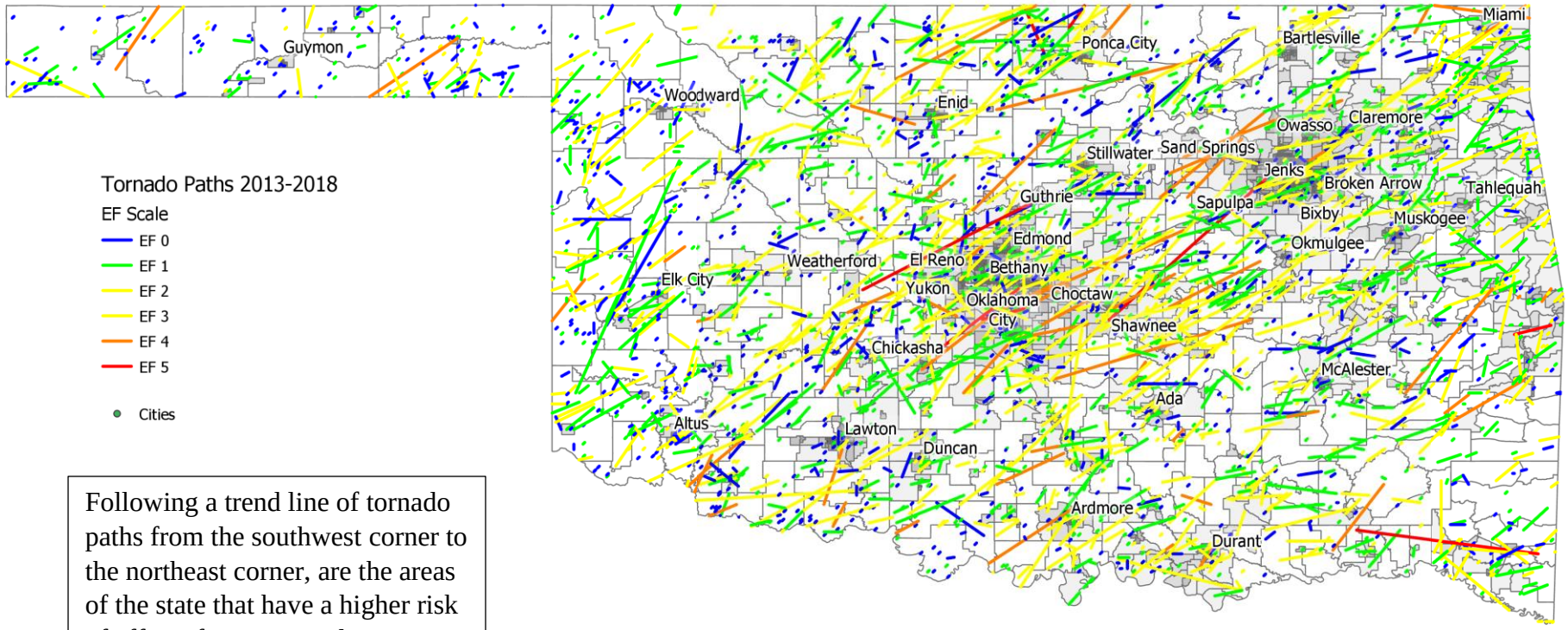
Number of County/Zone areas affected:	62
Number of Days with Event:	47
Number of Days with Event and Death:	14
Number of Days with Event and Death or Injury:	22
Number of Days with Event and Property Damage:	31
Number of Days with Event and Crop Damage:	0

NOAA NCDC

Probability of Future Events and Risk Calculations

The CPRI for the Tornado hazard for the State of Oklahoma is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(2 x .45)	+ (1 x .30)	+ (3 x .15)	+ (2 x .10)	= 2.95

Jurisdiction affected by Tornadic Hazards



Following a trend line of tornado paths from the southwest corner to the northeast corner, are the areas of the state that have a higher risk of effects from a tornadic event. This risk is amplified due to the location of the (2) metropolitan areas of Oklahoma City and Tulsa, of which both lie in the central portion of this trend line.

3.3.11 Wildfire

Wildfire Hazard Profile Elements

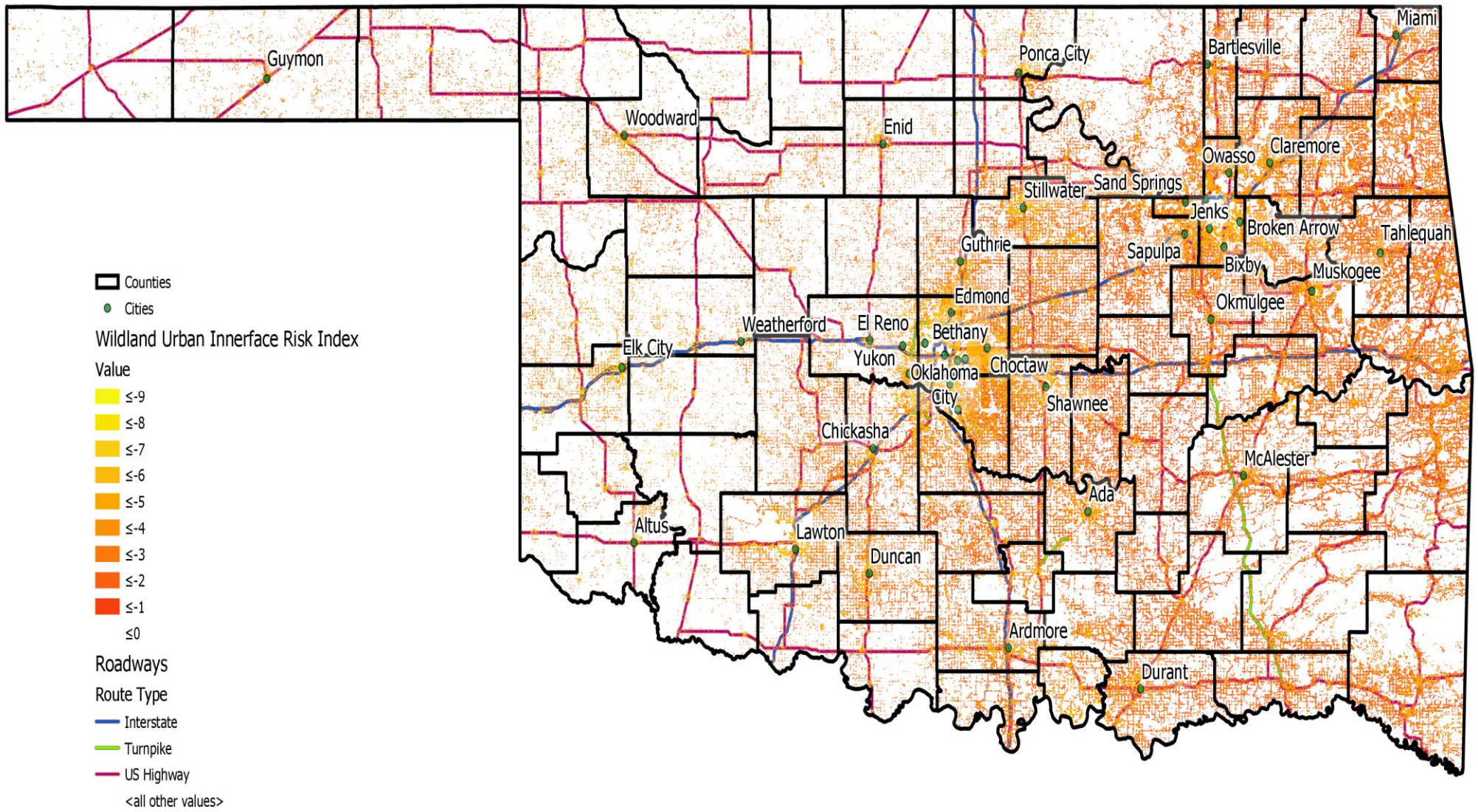
Description: Wildfire is an uncontrolled fire in a rural or wilderness area burning in natural fuels. There are three different classes of wildfires. Only 2 classes of wildfire normally occur in Oklahoma, surface fire and crown fire. A surface fire is common in grasslands, or areas with open vegetation, and can spread quickly. Crown fires are those that move through the crowns of trees or shrubs more or less independently of the surface fire. The highest impact wildfires occur during periods of drought.

Location: see following page.

Previous Occurrence: From 2007 to present, Oklahoma has had 51 FMAG Fires. This is an average of 4.6 FMAG Fires per year. During this period only 2 years did not have an FMAG Fire.

Probability of Future Events:

The CPRI for Wildland Fire for the State of Oklahoma is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(2 x .45)	+ (1 x .30)	+ (3 x .15)	+ (2 x .10)	= 2.95


Guymon
Woodward
Enid
Ponca City
Bartlesville
Miami
Owasso
Claremore
Stillwater
Sand Springs
Jenks
Broken Arrow
Tahlequah
Guthrie
Sapulpa
Bixby
Muskogee
Edmond
Okmulgee
Weatherford
El Reno
Bethany
Elk City
Yukon
Oklahoma City
Choctaw
Shawnee
Chickasha
McAlester
Ada
Altus
Lawton
Duncan
Ardmore
Durant
Counties
Cities
Wildland Urban Innerface Risk Index
Value
≤-9
≤-8
≤-7
≤-6
≤-5
≤-4
≤-3
≤-2
≤-1
≤0
Roadways
Route Type
Interstate
Turnpike
US Highway
<all other values>

Vulnerable Populations:

WUI Risk Index Description: The Wildland Urban Interface (WUI) Risk Index layer is a rating of the potential impact of a wildfire on people and their homes. The key input, WUI, reflects housing density (houses per acre) consistent with Federal Register National standards. The location of people living in the Wildland Urban Interface and rural areas is key information for defining potential wildfire impacts to people and homes. The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact. For example, areas with high housing density and high flame lengths are rated -9 while areas with low housing density and low flame lengths are rated -1. Referencing the previous Wildland Fire location map, the map indicates the rating level that has been determined for those locations. Additionally the graph below provides a breakdown of the acreage that would be classified into the 9 Impact ratings.

Class	Acres	Percent
-9 Major Impacts	1,795	0.0 %
-8	45,695	0.5 %
-7	313,020	3.3 %
-6	295,886	3.1 %
-5 Moderate	1,210,006	12.8 %
-4	947,856	10.0 %
-3	1,326,026	14.0 %
-2	4,426,034	46.8 %
-1 Minor Impacts	885,413	9.4 %
Total	**9,451,731**	**100.0 %**

3.3.12 Winter Storms (Ice, Freezing Rain, Snow)

Description: A severe winter storm can range from freezing rain or sleet to moderate snow over a few hours to blizzard conditions and extremely cold temperatures that lasts several days.

WINTER STORM can refer to a combination of winter precipitation, including snow, sleet and freezing rain.

SEVERE WINTER STORM is one that drops 4 or more inches of snow during a 12–hour period, or 6 or more inches during a 24- hour span.

BLOWING SNOW is wind-driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground and picked up by the wind.

BLIZZARDS occur when falling and blowing snow combine with high winds of 35 mph or greater reducing visibility to near zero.

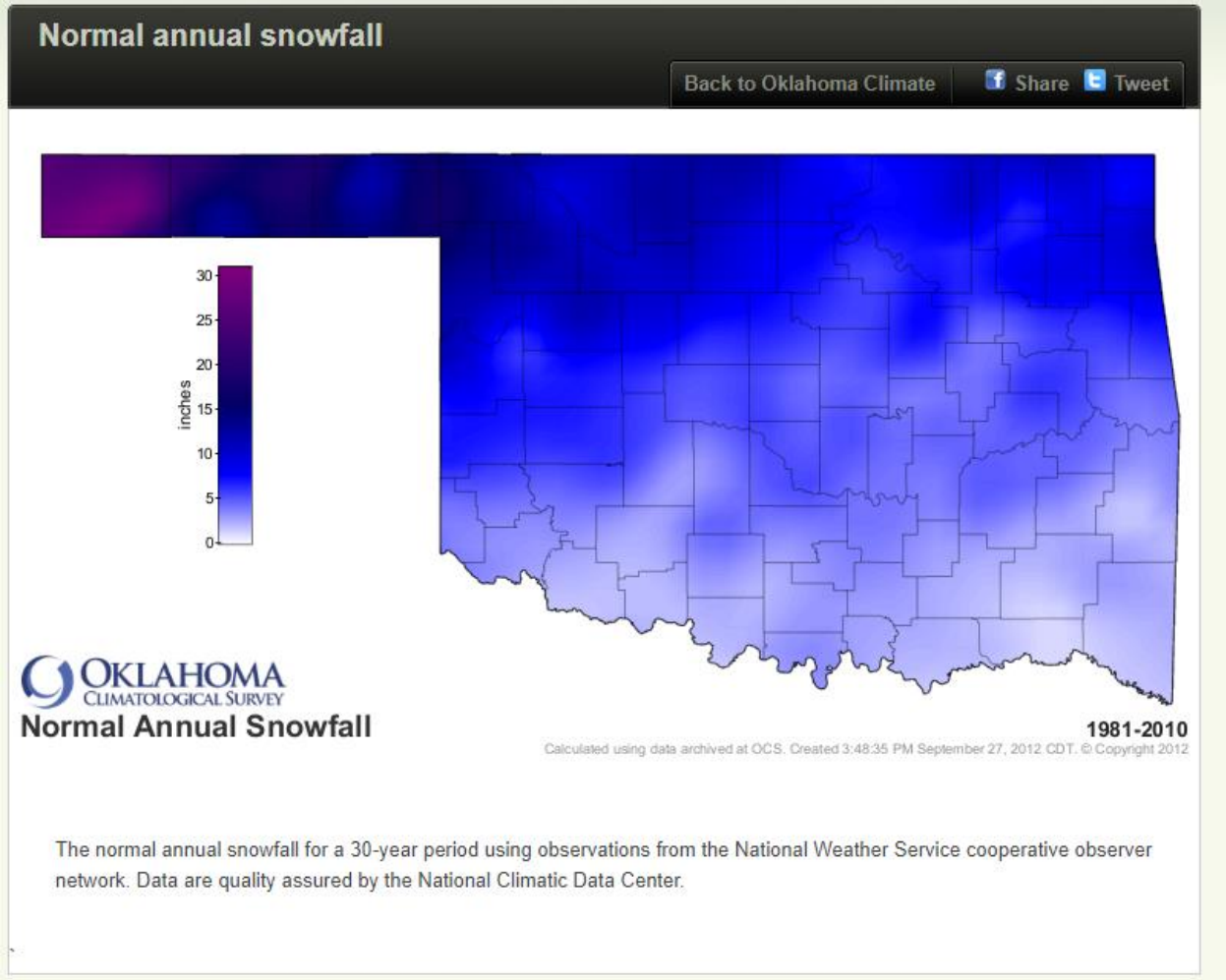
FREEZING RAIN is rain that falls as liquid onto a surface with a temperature below freezing. This causes the drops to freeze on contact onto surfaces like trees, utility lines, cars, and roads, forming a coating or glaze of ice. Even small accumulations of ice can cause a significant hazard.

SLEET is frozen precipitation that has melted by falling through a warm layer of the atmosphere and then refreezes into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not immediately stick to objects. However, it can accumulate like snow and cause a hazard to motorists.

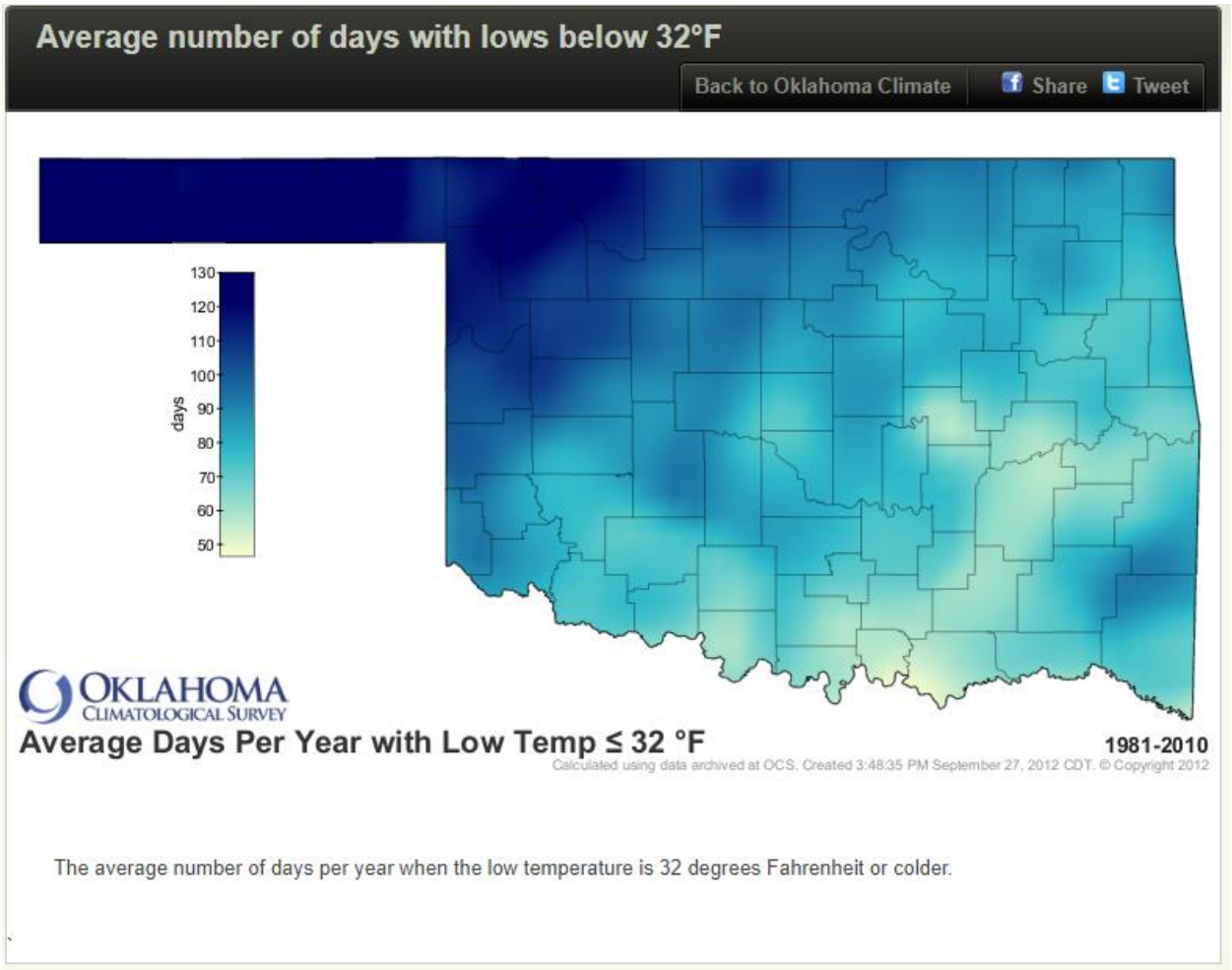
ICE STORMS are extended freezing rain events, lasting several hours to sometimes days, when the freezing rain accumulates a thick enough glaze on surfaces to damage trees, utility lines, and cause major travel hazards. Ice storms can result in a heavy glaze an inch thick or more, but even a quarter inch ice accumulation can cause problems under windy conditions.

WIND CHILL is used to describe the relative discomfort and danger to people from the combination of cold temperatures and wind. The wind chill chart below from the National Weather Service shows the apparent temperature derived from both wind speed and temperature.

Location



The entire State of Oklahoma is at risk for Winter Storms, Ice and Freezing Rain. The gradient of average annual snowfall across Oklahoma increases from less than two inches in the extreme southeast to 30 inches in the western panhandle. The frequency of snow events also increases sharply along the same gradient. Locations in southeast Oklahoma have gone several years between events, while northwestern Oklahoma typically records several snow events each winter. Blowing snow and blizzard conditions can pose significant problems for automobile travelers, but the effects of most snowstorms in the state are short-lived. Snowfall remaining on the ground more than a few days is an uncommon occurrence in northwestern Oklahoma, quite rare in central Oklahoma, and almost unheard of in the southeast.



Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Wind chill is also a dangerous component of winter weather events. Wind chill is the

combination of wind and temperature that serves as an estimate of how cold it actually feels to exposed human skin. Wind chill values below -19 degrees Fahrenheit are considered extremely dangerous to the population of the State of Oklahoma, although hypothermia can still occur at higher temperatures and cause deaths. Parts of the Oklahoma Panhandle sometimes experience wind chills of -19 degrees several times per year.

Previous Occurrences:

Oklahoma Severe Winter Storm (DR-4299)

Incident period: January 13, 2017 to January 16, 2017

Major Disaster Declaration declared on February 10, 2017

Oklahoma Severe Winter Storms and Flooding (DR-4256)

Incident period: December 26, 2015 to January 05, 2016

Major Disaster Declaration declared on February 10, 2016

Oklahoma Severe Winter Storms and Flooding (DR-4247)

Incident period: November 27, 2015 to November 29, 2015

Major Disaster Declaration declared on December 29, 2015

Oklahoma Severe Winter Storm (DR-4164)

Incident period: December 05, 2013 to December 06, 2013

Major Disaster Declaration declared on January 30, 2014

Oklahoma Severe Winter Storm and Snowstorm (DR-4109)

Incident period: February 24, 2013 to February 26, 2013

Major Disaster Declaration declared on April 08, 2013

Probability of Future Events and Risk Calculations

The probability of heavy snow in Oklahoma increases gradually through fall and early winter to a peak in January, then remains high through March before dropping sharply in April. The panhandle and northwest counties are the most likely areas to receive heavy snow, averaging 1 to 2 4-inch or greater snow events per year, and one 8-inch event every 1 to 2 years. Counties along the Red River in southern Oklahoma are least likely to experience heavy snowfall, but still can expect one 4-inch or greater snowfall on average every 3 to 4 years. Snowfalls of 8 inches or more occur on average in these areas only about once every two decades. The three largest population centers in Oklahoma - Oklahoma City, Tulsa, and Lawton - all average one 4-inch or greater snowfall event every 1 to 2 years. Eight 8-inch or greater events average roughly one every 5 years in Tulsa, one every 5 to 10 years in Oklahoma City, and one every 10 to 20 years in Lawton. The peak month for 4-inch or greater events varies from January across southern and

east central Oklahoma, to February in west-central and north-central Oklahoma, to March in the panhandle and far northwest. There may be a secondary early-season peak (December or January) in the far northwest. Peak months for 8-inch or greater events are generally the same as those for 4-inch events - except in northeast Oklahoma, where the 8-inch peak shifts to March. The most likely place and time to experience heavy snow in Oklahoma: The Panhandle in March. Source: NWS Norman Forecast Office

The CPRI for Winter Storm hazard for the State of Oklahoma is:				
Probability	+Magnitude/Severity	+ Warning Time	+ Duration	= CPRI
(2 x .45)	+ (1 x .30)	+ (1 x .15)	+ (3 x .10)	= 1.65

Jurisdictions Most Vulnerable to Hazard: Severe winter storms can have a tremendous impact on individuals, animals, and communities. Cold temperatures, snow, ice, blizzard conditions with high winds and dangerous wind chills can all occur, leading to personal injury and possibly deaths. High winds combined with cold temperatures speeds the rate of heat loss to the body making serious health problems, such as frostbite or hypothermia more likely. Additional fatalities may occur from vehicle accidents, fires or carbon monoxide poisoning following the misuse of heaters. Dangerous driving conditions can lead to travelers being stranded on the road. Accumulations of snow and ice can result in road closures or blockages – isolating homes and farms for days. The heavy weight burden may cause roofs to collapse or knock down trees and power lines resulting in power outages and subsequent loss of heat in homes. Animals are also at risk during severe winter weather and are subject to wind chill factors, hypothermia and frostbite. Deaths can also occur due to dehydration, when water sources freeze and become unavailable. Winter conditions may make getting food and water to animals more difficult. Unprotected livestock may be lost. Businesses must also make preparations for winter storm situations. Protection of their employees will be necessary to ensure their safety. Employees that must work outdoors during extreme situations should be provided the necessary education on risk and measures to stay safe. Source: the Center for Food Security and Public Health, Iowa State University

3.4 Risk Assessment of State Facilities and Estimated Potential Dollar Losses Element (S5)

For the purpose of this plan *critical facilities* means: State owned assets which are vital to health, safety and well-being of Oklahomans during a time of Natural Disaster.

The State of Oklahoma owns just over 9,000 buildings structures and appendages with a total building value in excess of **1.3** billion dollars with contents over 14 million dollars.

The buildings in the State of Oklahoma are as vulnerable to natural disaster just as any other building, public or private. This includes the most critical state facilities where public health and safety functions are performed or coordinated:

- National Guard facilities
- Emergency Operations Center
- Highway Patrol HQ and district patrol headquarters
- Communications and computer systems
- Specific government agencies/offices
- State Penitentiary –over 1400 dangerous criminals at OSP, over 23,000 system-wide.
- State Medical Examiner

This plan emphasizes the MOST critical state owned and operated facilities. The exclusion of a building from the list does not mean that it houses an unimportant function; it just means the Planning Team chose to use the most critical facilities based on the activities and functions carried out at the locations profiled. It should also be noted that some critical facilities such as most of the electric and gas utility providers are privately owned, not government owned. These private facilities are not profiled as a part of this plan.

METHODOLOGY:

In Oklahoma, the Office of Management and Enterprise Services, Division of Capital Assets Management, **Risk Management** Department, maintains a current list of state owned or leased facilities that represents all properties currently on file with OMES and insured under its Property Insurance Program. This division uses a software program that is capable of keeping statistics on all the state facilities and a historical profile of each. A listing of these properties is was provided for use in developing the State Facility Risk Assessment.

CATASTROPHIC	≤ Multiple deaths. ≤ Complete shutdown of facilities for 30 or more days. ≤ More than 50% of property is severely damaged.
CRITICAL	≤ Injuries and/or illnesses result in permanent disability. ≤ Complete shutdown of critical facilities for at least two weeks. ≤ More than 25% of property is severely damaged.
LIMITED	≤ Injuries and/or illnesses do not result in permanent disability. ≤ Complete shutdown of critical facilities for more than one week. ≤ More than 10% of property is severely damaged.
NEGLIGIBLE	Injuries and/or illnesses are treatable with first aid. Minor quality of life lost. Shutdown of critical facilities and services for 24 hours or less. Less than 10% of property is severely damaged.

These facilities can range from the Oklahoma State Capitol Complex in Oklahoma City to a local office in a county providing state services. These facilities are hubs for everything from administrative activities to public safety functions and every conceivable role in between. Should these facilities be rendered inoperable by a natural hazard, the public will lose a vital link between them and their government and the services the government provides.
All state owned/operated facilities are potentially vulnerable to damage and impacts caused by the hazards found below. These hazards have the potential to affect facilities statewide. Although, the effect of these hazards on the facilities may not be location specific, their location does have an impact on the frequency that these facilities may be exposed to these hazards.

Severe Storms, Tornadoes and Wind Hazard: Storms and tornadoes can damage or destroy state facilities in a jurisdiction, thus cutting off vital state government services to the citizens in that area. State facilities would have comparable vulnerability to severe storms and tornadoes as all facilities located within a said county.

FLOOD HAZARD:
State owned facilities are not usually located in flood prone areas, although certain segments of state property may be subject to occasional flooding. This flooding is minor and is addressed in the profile for that facility.

WINTER STORMS/SNOW AND ICE:
Oklahoma winter storms are seldom severe enough to cause extensive damage to state owned facilities however ice or heavy buildups of snow do occasionally cause roofs to collapse.

EARTHQUAKE:
Earthquakes in Oklahoma are seldom severe enough to damage structures such as our state facilities. In a worst case scenario however, severe damage could occur to most of the facilities because most Oklahoma buildings are not constructed for earthquakes.

DROUGHT, EXTREME HEAT, LANDSLIDE, WILDFIRE:

Our state critical facilities are generally not affected by these hazards. In the rare event they are, the structures are such that there would be little if any damage. In the case of Landslides, Oklahoma landslides are usually minor and seldom affect structures. No state facilities are known to be in landslide areas.

Wildfires risk would be highest in those state facilities located in the Wildland Urban Interface and those located in rural areas.

ROADS AND HIGHWAYS AND BRIDGES:
The transportation corridors such as roads, highways and bridges in the State of Oklahoma are critical not only to the motoring public but to economic development, and emergency response following disasters.

CONCLUSIONS:
This hazard analysis and risk assessment is based on the best and most up to date available data from state and local sources. It presents a reasonable range of hazards that have affected the state in the past. By projection based on the effects of those events, those same hazards and affects can be expected to have an effect on the state in the future.

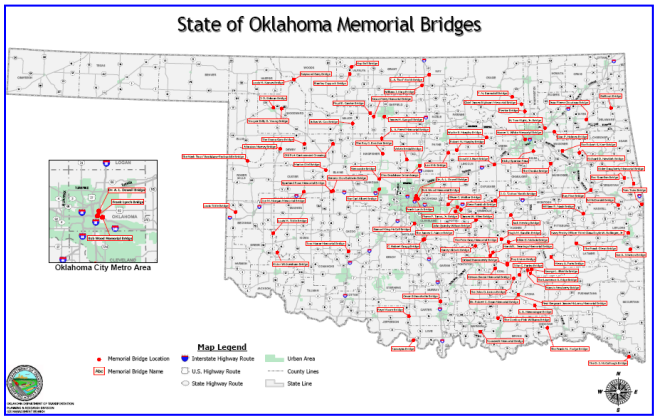
We can however make some conclusions from this analysis and assessment:

- State owned critical facilities are no more exposed to natural hazards than are other structures in the same general vicinity.
- Critical facilities deserve additional mitigation attention because of the higher potential for life and property loss or environmental harm in the event they suffer damage.
- Oklahoma, Tulsa, Comanche, Rogers, Pittsburg and Cleveland Counties have the highest populations of those facilities reviewed. These counties also have a larger proportion of the state facilities due to being counties with large to significant city sizes.
- Northeast, Southeast, and Southwest Areas have the highest vulnerability in terms of the number of state-owned facilities.
- Northeast, Southwest, and Central Areas have the highest vulnerability in terms of the total dollar exposure to state owned facilities, respectfully.

It is important to note that, although some hazards are classified as very low or moderate in probability of occurrence, it does not mean that they cannot affect Oklahoma in a significant way, only that such an occurrence is relatively less likely to cause damage if it does occur. The hazard analysis in this document provides insights for planning purposes and determination of priorities, but it cannot offer guarantees.
In order to get a realistic picture of a facility or jurisdictions vulnerability to natural hazards, each agency must conduct its own hazard identification and risk analysis. Oklahoma Emergency Management will make reasonable attempts to standardize the type and format of hazard and vulnerability information in local mitigation plans and through contact with state agencies important to disaster response and preparedness.

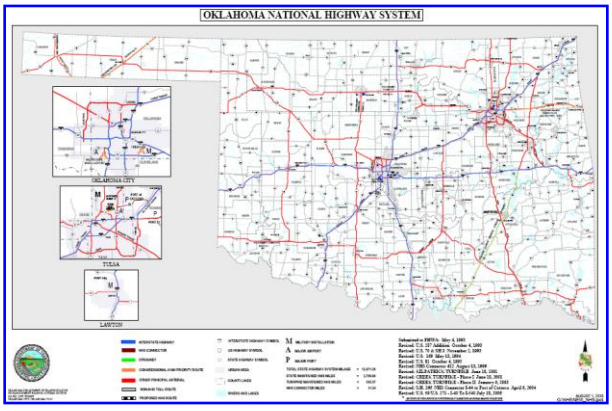
ROADS, HIGHWAYS, BRIDGES AND RAILROADS:

In 2016, Oklahoma had 4,274,355 registered motor vehicles, with 2,655,916 licensed drivers. In order to handle that many local residents as well as "drive through" traffic from other states, Oklahoma has almost 13,000 miles of highways, 608 miles of turnpikes and 85,000 miles of county roads and over 77,000 bridges.



These transportation arteries are necessary for Oklahoman's daily routines but they are critical to those responding to disasters.

The major towns of Oklahoma are connected by state and national highways. The northern and the southern part of Oklahoma are joined by Interstate Highway 35. The eastern end of Oklahoma is connected to the western end of the state by Interstate Highways 40. I-44 runs through Oklahoma City and Tulsa from the northeastern corner of the state to the southwestern portion of the state where it exits to Texas at Wichita Falls. I-40 and I44 are primary travel arteries connecting the eastern and western United States.



The other prominent route is I-35 which makes the cities north and south of Oklahoma easily accessible. Some of the more important US Highways of the state are 81, 70, 283, 69, 259 and 77. Historic U.S. Highway 66 also follows a route through Oklahoma from east to west.

The roads and bridges in Oklahoma are subject to natural hazards as are buildings in Oklahoma. Roads and bridges flood and when the floodwaters go down, the roads are missing either in part or in whole. Entire bridges washout and cause roads that may not have been designed for heavy traffic to be used as detours. Tornado's also cause road damage in areas with damage to overlay and directional signs.

Drought and wildfire heat causes damage to roadways, again leaving cracked, broken and otherwise damaged roadways. Winter Storms have the same effect. Earthquakes, though minor sometimes damage roads and highways in Oklahoma. Losses vary widely by pre-disaster condition, quality, construction materials used, roadbed preparation and other considerations of road strength. Highways, Interstates and turnpikes all fair better during natural hazards because they are well constructed with heavy vehicle traffic being a primary consideration. County roads and state highways usually have less stringent design standards, and are more susceptible to hazards.

Railroads in Oklahoma are not owned by the State of Oklahoma, and although they are a critical facilities, they have not been profiled in this plan.

Major Electrical Transmission Lines, Generating and Relay Stations
Electricity is the fuel that powers our society. Power outages can severely disrupt everyday activities, and have significant effect to regional economic output. Locally electrical disruption for heat or air conditioning can endanger lives.

Severe Storms and Tornadoes: Will damage distribution infrastructure, and disrupt service.
Floods: Floods can inundate Relay Stations and render them inoperable.
Severe Winter Storms Will damage distribution infrastructure, and disrupt service.
Drought: Drought has had impacts on hydroelectric power stations. 5% of Oklahoma's electrical generation power comes from hydroelectric dams. Loss of generation requires that other generation capabilities provide the makeup of loss.
Extreme Heat: Extreme heat can cause power outages when increased public demand for power outpaces the generating station's ability to produce power.
Earthquake: Earthquakes can sever transmission lines and impact generation and relay stations through emergency shut downs to damage and possible destruction.

Current listing of State Owned Buildings

Appendix "A" is the current listing of State Facilities and the quartile values. This listing is For Official Use Only. Individuals and parties requesting the Appendix are requested to contact OEM on current policy and procedure to request a copy.

(NOTE: APPENDIX "A" IS NOT FOR PUBLIC RELEASE DUE TO SECURITY OF STATE CRITICAL FACILITIES)

3.5 Vulnerability of Jurisdictions Element (S6)

As of 2018, OEM currently does not have access to a statewide risk vulnerability study or risk assessment on the identified hazards in the State plan update

Based on the projected development of the (2) Metropolitan Statistical Areas of Oklahoma City and Tulsa, along with additional cities and towns in Oklahoma will be exposed to increasing risk as their development patterns change. These patterns, such increased density of development, and expanded transportation corridors, will lead to an increased potential of risk for jurisdictions in Oklahoma. While there are multiple risk factors that effect a community, those dominant factors of overall growth of population, increased density of settlement, location of settlement areas in high risk locations, and community policies will be the main contributor to the local community risk. These factors, acting in concert in with the push pull forces of economic and cultural migrations, will serve to heighten the overall risk factors in urban and suburban areas in more populous areas.

Vulnerable Communities and Climate Change- adapted from the National Climate Assessment 2014

The Great Plains is home to a geographically, economically, and culturally diverse population. For rural and tribal communities, their remote locations, sparse development, limited local services, and language barriers present greater challenges in responding to climate extremes. Working-age people are moving to urban areas, leaving a growing percentage of elderly people in rural communities.

Overall population throughout the region is stable or declining, with the exception of substantial increases in urban Texas, tribal communities, and western North Dakota, related in large part to rapid expansion of energy development. Growing urban areas require more water, expand into forests and cropland, fragment habitat, and are at a greater risk of wildfire – all factors that interplay with climate.

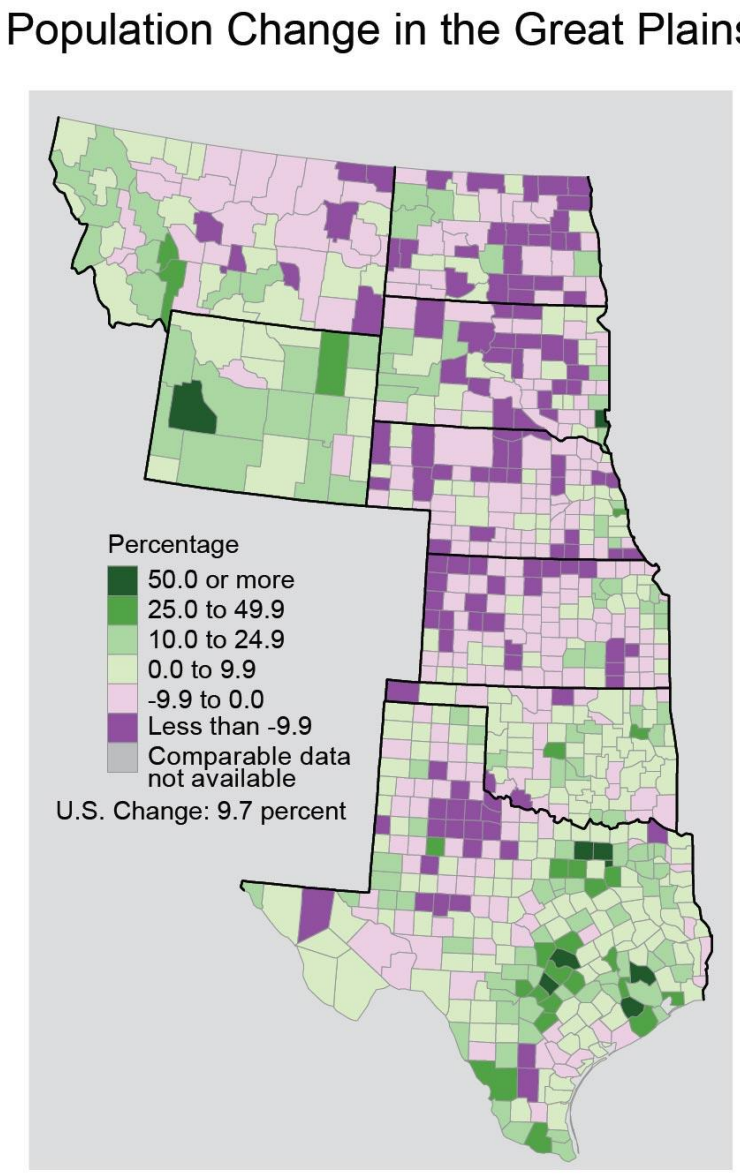


Figure 19.8: Population Change in the Great Plains

Populations such as the elderly, low-income, and non-native English speakers face heightened climate vulnerability. Public health resources, basic infrastructure, adequate housing, and effective communication systems are often lacking in communities that are geographically, politically, and economically isolated. Elderly people are more vulnerable to extreme heat, especially in warmer cities and communities with minimal air conditioning or sub-standard housing. Language barriers for Hispanics may impede their ability to plan for, adapt to, and respond to climate-related risks.

The 70 federally recognized tribes in the Great Plains are diverse in their land use, with some located on lands reserved from their traditional homelands, and others residing within

territories designated for their relocation, as in Oklahoma. While tribal communities have adapted to climate change for centuries, they are now constrained by physical and political boundaries. Traditional ecosystems and native resources no longer provide the support they used to. Tribal members have reported the decline or disappearance of culturally important animal species, changes in the timing of cultural ceremonies due to earlier onset of spring, and the inability to locate certain types of ceremonial wild plants.

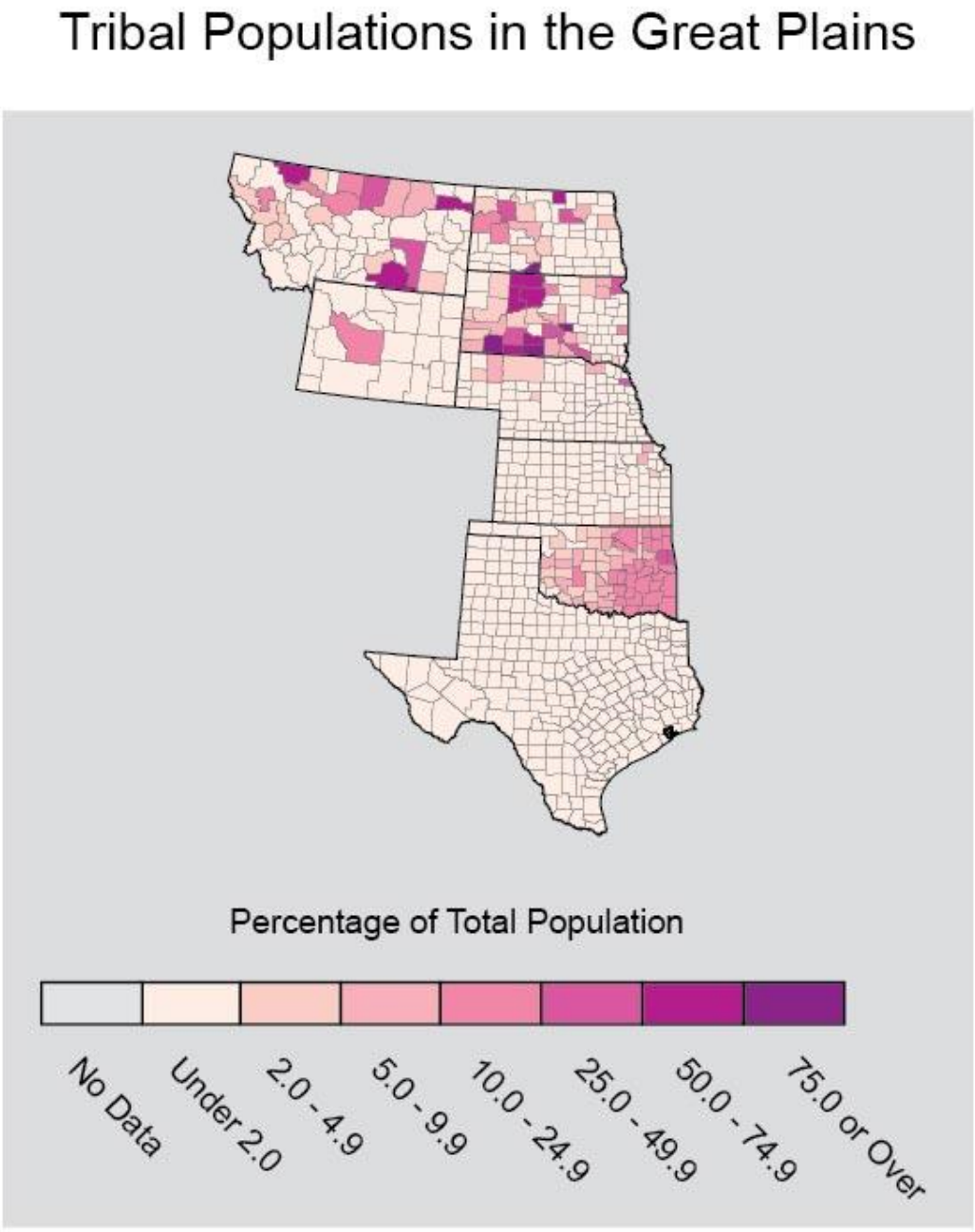
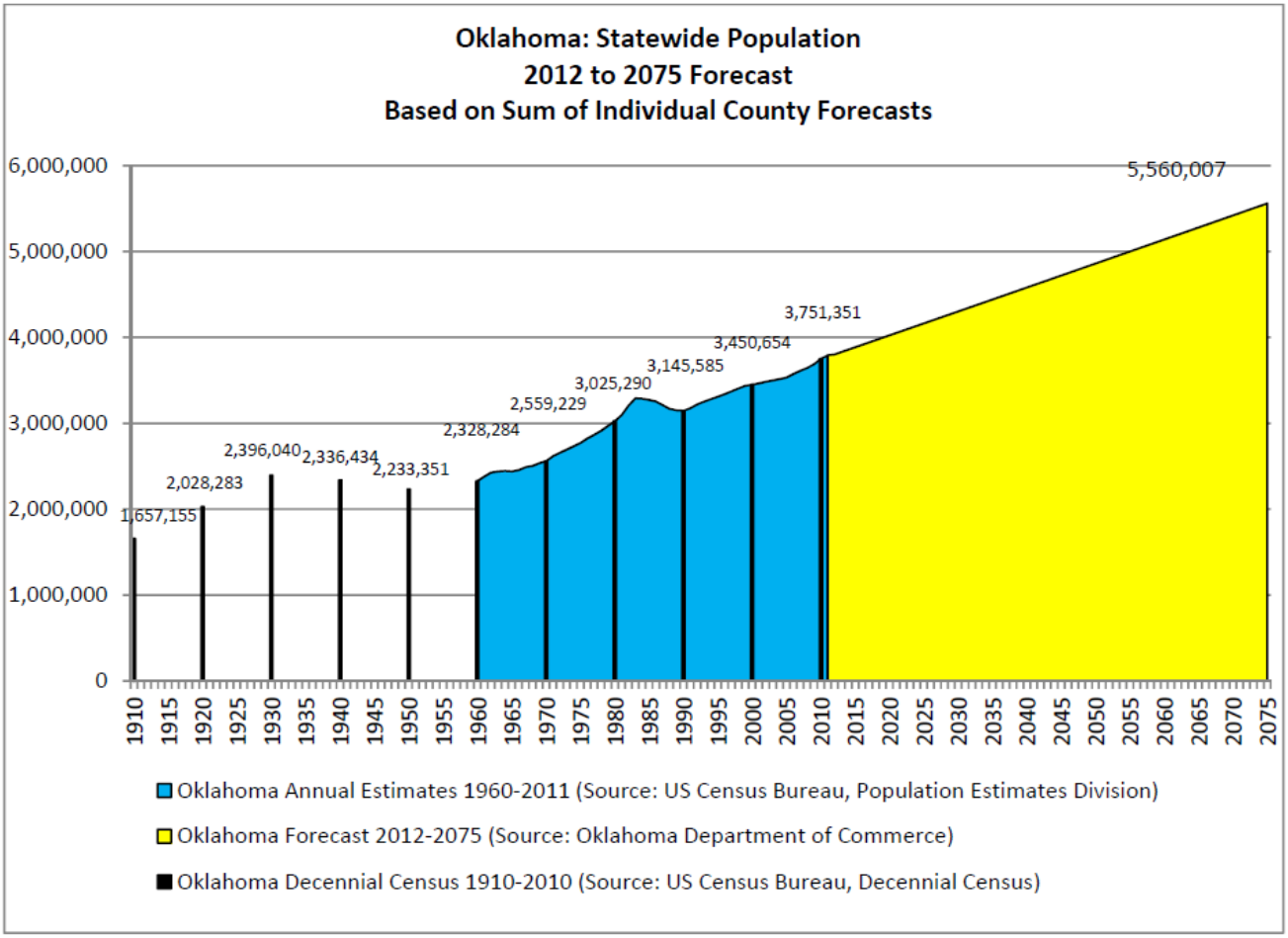


Figure 19.9: Tribal Populations in the Great Plains

3.6 How the Plan Risk Assessment was revised to Reflect Changes in Development Element S7

3.6.1 Demographic Change-According to the Oklahoma Department of Commerce, the following demographic changes are forecasted to occur in the next several decades for Oklahoma.



By the 2020 Census, Oklahoma's population will top 4 million

By the mid-2050s, Oklahoma's population will top 5 million

By 2075, Oklahoma's population will top 5.5 million

Oklahoma's population is forecast to grow at an average annual rate of 0.73% over the next 65 years, equivalent to the US Census Bureau's most recent national growth forecasts through 2050. The Census Bureau does not have state level population forecasts.

Counties surrounding present day Tulsa and Oklahoma City metro areas are forecast to see substantial population growth. In 2010, the 14 counties currently included in the Tulsa and

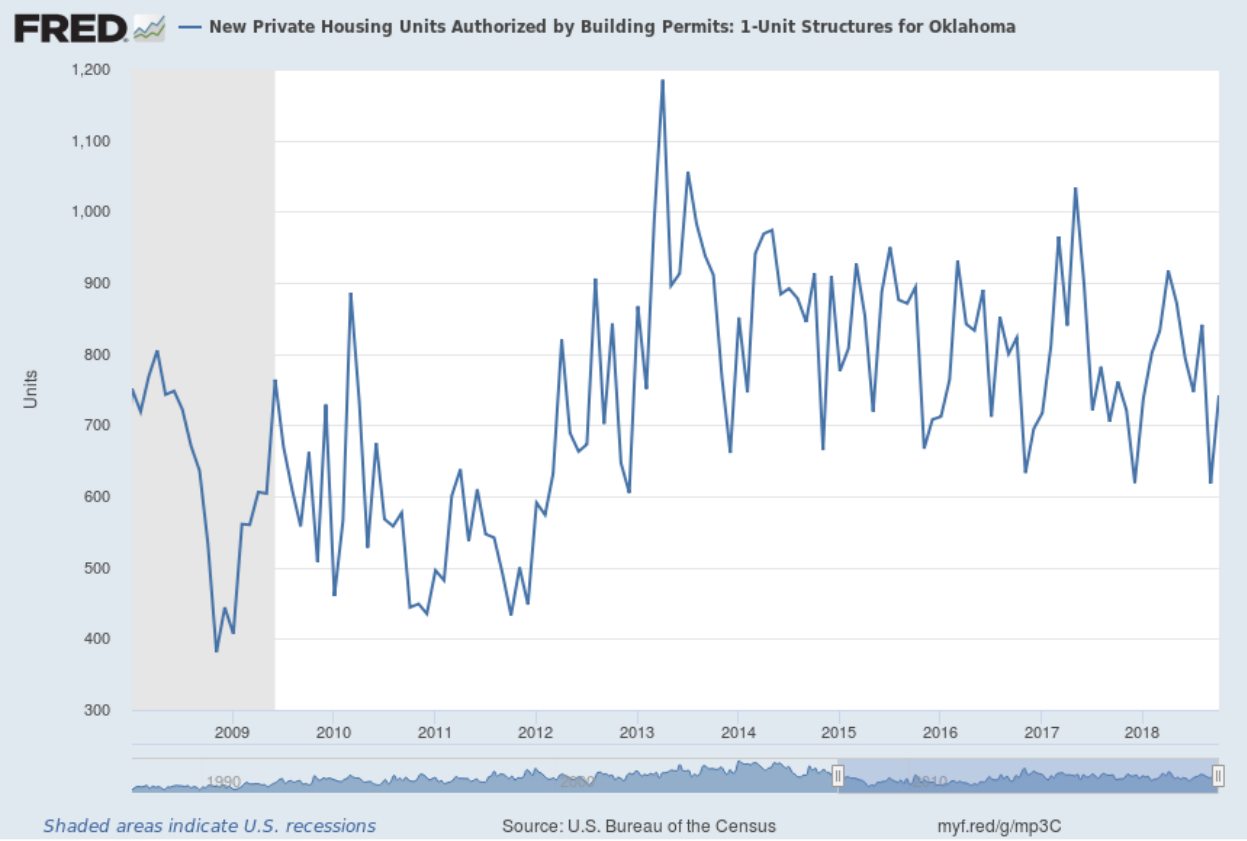
Oklahoma City MSAs combined to represent 58.4% of the state's total population but by 2075, those same 14 counties are forecast to represent 64.2% of the state's total population. Tulsa and Oklahoma counties alone will combine to represent 35.6% of the state's population.

2010 Population for Counties That Make Up Present Day Tulsa and OKC MSAs			
Creek	69,967	Canadian	115,541
Okmulgee	40,069	Cleveland	255,755
Osage	47,472	Grady	52,431
Pawnee	16,577	Lincoln	34,273
Rogers	86,905	Logan	41,848
Tulsa	603,403	McClain	34,506
Wagoner	73,085	Oklahoma	718,633
Total Tulsa MSA	937,478	Total OKC MSA	1,252,987
Percentage of Statewide total	25.0%		33.4%

Source: US Census Bureau, Decennial Census

2075 Population Forecast for Counties That Make Up Present Day Tulsa and OKC MSAs			
Creek	109,751	Canadian	232,316
Okmulgee	44,406	Cleveland	521,368
Osage	71,916	Grady	82,549
Pawnee	24,929	Lincoln	55,400
Rogers	173,122	Logan	69,711
Tulsa	934,215	McClain	61,698
Wagoner	144,991	Oklahoma	1,042,525
Total Tulsa MSA	1,503,330	Total OKC MSA	2,065,568
Percentage of Statewide total	27.0%		37.2%

Source: Oklahoma Department of Commerce



3.6.2 Development Trends

Counties with growing populations and acceleration in housing will have increased vulnerability to hazard events such as tornadoes and floods. Most counties experiencing development pressures participate in the National Flood Insurance Program. Even though these counties and communities have a flood damage prevention ordinance, this does not mean the flood risk should be less. Incorporation of higher regulatory standards is one way in which counties can better protect building, infrastructure, and save lives. Rural communities with declining populations and housing will have increased vulnerability to weather related hazards and a lower resilience to loss because there is reduced or little surplus capacity to absorb crop or livestock income losses. Even small losses might feed back into poverty and future vulnerability. Additionally, declining population and housing may also result in fewer number of response and recovery resources, such as fire departments and medical facilities. While counties are not experiencing development pressure, participation in the NFIP remains a recommended mitigation measure.

3.6.3 Changing Future Conditions

State Hazard Mitigation Plans must consider how future risk and vulnerability may be affected by changing future conditions, development patterns, and population demographics. In furtherance of FEMA's Climate Change Adaptation Policy (2011-OPPA-01) which directed all FEMA programs and policies to integrate considerations of climate change adaptation, the FEMA State Mitigation Plan Review Guide effective March 6, 2016 clarified that the probability of future hazard events must also include consideration of the effects of long-term changes in weather patterns and climate on the future conditions related to identified hazards. Changes in the probability of future hazard events may include changes in location, increases or decreases to the impacts, and/or extent of known natural hazards, such as flood or drought. Changes in

temperature, intensity, hazard distribution, and/or frequency of weather events may increase vulnerability to these hazards in the future.
It is difficult to predict the scope, severity, and pace of changing future conditions and the impacts posed by more intense storms, frequent heavy participation, heat waves, drought, and extreme flooding; none-the less, according to the FEMA Climate Change Adaptation Policy Statement, they can significantly change the probabilities and magnitudes of hazards faced by communities.
According to the U.S. Environmental Protection Agency, “Climate change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects that occur over several decades or longer” https://www.epa.gov/climatechange/climate-change-basic-information).
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NCEI:www.ncei.noaa.gov/climate-information/climate-change-and-variability

NOAA’s National Centers for Environmental Information (NCEI) defines climate as long-term averages
And variations in weather measured over a period of several decades. The Earth’s climate system includes the land surface, atmosphere, oceans, and ice. Many aspects of the global climate are changing rapidly, and many experts believe that the primary drivers of that change are human in

origin. Evidence for changes in the climate system abounds, from the top of the atmosphere to the depths of the oceans.

The Global Change Research Act of 1990 is a federal law which requires research into global warming and related issues. A report to Congress is required every four years on the environmental, economic, health and safety consequences of climate change. The National Climate Assessment is the report prepared to meet this law and is forwarded to the President and to Congress.

The National Climate Assessment presents 12 key messages about the United States' changing climate and it looks at how the changing climate impacts 13 different Sectors such as water, energy, transportation, agriculture, forests, and rural communities to name a few.

Third U.S. National Climate Assessment Key Findings

 Global climate is changing and this is apparent across the United States in a wide range of observations. The global warming of the past 50 years is primarily due to human activities, predominantly the burning of fossil fuels.

 Some extreme weather and climate events have increased in recent decades, and new and stronger evidence confirms that some of these increases are related to human activities.

 Human-induced climate change is projected to continue, and it will accelerate significantly if global emissions of heat-trapping gases continue to increase.

 Impacts related to climate change are already evident in many sectors and are expected to become increasingly disruptive across the nation throughout this century and beyond.

 Climate change threatens human health and well-being in many ways, including through more extreme weather events and wildfire, decreased air quality, and diseases transmitted by insects, food, and water.

 Infrastructure is being damaged by sea level rise, heavy downpours, and extreme heat; damages are projected to increase with continued climate change.

 Water quality and water supply reliability are jeopardized by climate change in a variety of ways that affect ecosystems and livelihoods.

 Climate disruptions to agriculture have been increasing and are projected to become more severe over this century.

 Climate change poses threats to Indigenous Peoples' health, wellbeing, and ways of life.

 Ecosystems and the benefits they provide to society are being affected by climate change. The
capacity of ecosystems to buffer the impacts of extreme events like fires, floods, and severe storms is being overwhelmed.

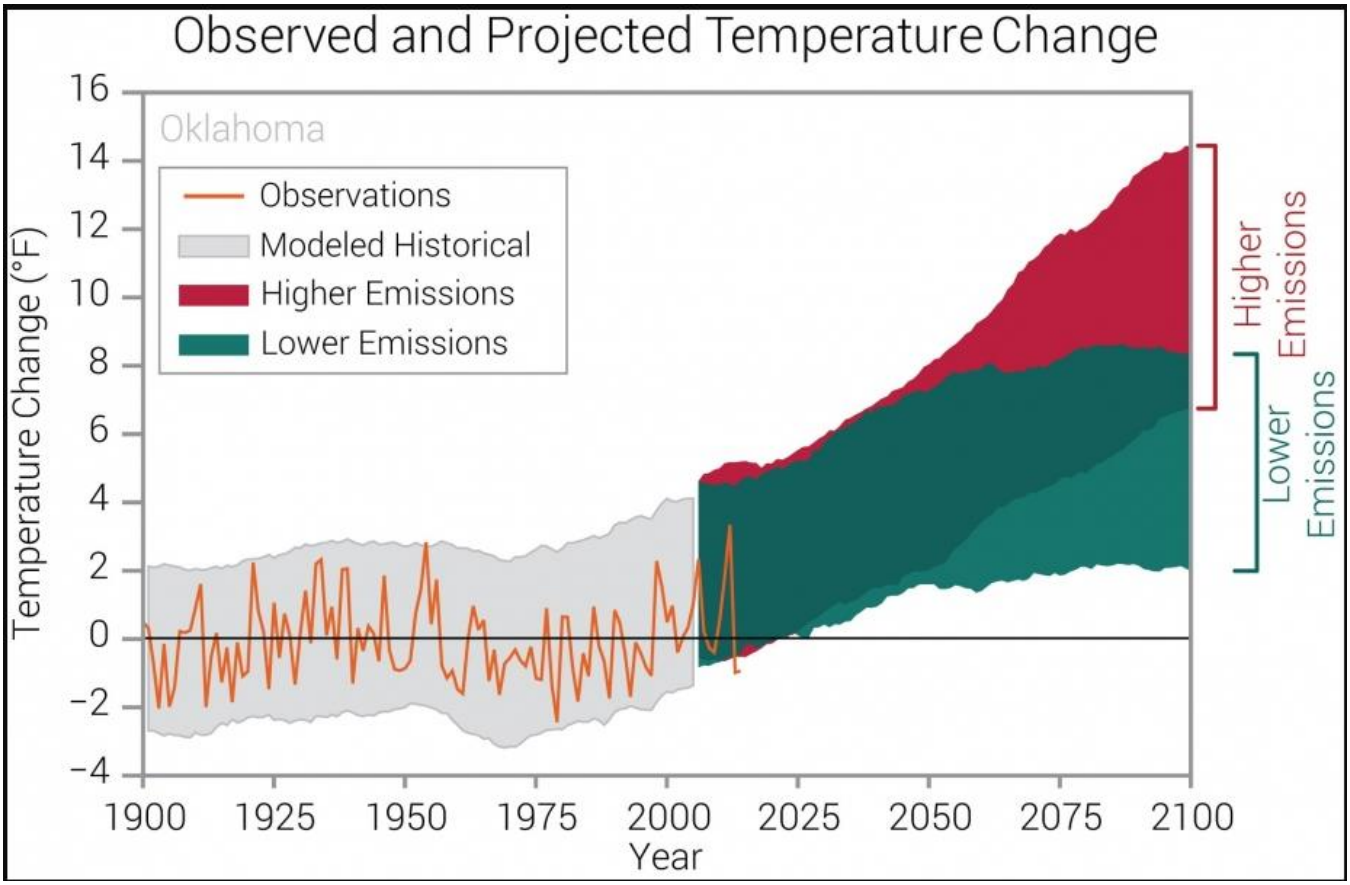
 Ocean waters are becoming warmer and more acidic, broadly affecting ocean circulation, chemistry, ecosystems, and marine life.

 Planning for adaptation (to address and prepare for impacts) and mitigation (to reduce future climate change, for example by cutting emissions) is becoming more widespread, but current
implementation efforts are insufficient to avoid increasingly negative social, environmental, and
economic consequences.

3.6.4 NOAA NCEI STATE CLIMATE SUMMARIES-OKLAHOMA

Oklahoma lies in the central Great Plains, straddling the transition from relatively abundant precipitation (more than 50 inches annually) in the southeast to semi-arid conditions (less than 20 inches) in the west. Due to its location in the interior of the United States and some distance from the moderating effects of any oceans, the state experiences a wide range of temperatures, averaging less than 40°F in the winter to almost 80°F in the summer. The hottest year on record was 2012 with an average temperature of 63.2°F, which is 3.5°F degrees warmer than the long-term average. Extreme temperatures for the state range from 120°F, observed at several locations in the summer of 1936, to 31°F observed in northeastern Oklahoma during the winter of 2011.

FIGURE 1



Observed and projected changes (compared to the 1901–1960 average) in near-surface air temperature for Oklahoma. Observed data are for 1900–2014. Projected changes for 2006–2100 are from global climate models for two possible futures: one in which greenhouse gas emissions continue to increase (higher emissions) and another in which greenhouse gas emissions increase at a slower rate (lower emissions). Temperatures in Oklahoma (orange line) have risen less than 1°F since the beginning of the 20th century. Shading indicates the range of annual temperatures from the set of models. Observed temperatures are generally within the envelope of model simulations of the historical period (gray shading). Historically unprecedented warming is projected during the 21st century. Less warming is expected under a lower emissions future (the coldest years being about 2°F warmer than the long-term average; green shading) and more warming under a higher emissions future (the hottest years being about 11°F warmer than the hottest year in the historical record; red shading). Source: CICS-NC and NOAA NCEI.

Since the beginning of the 20th century, temperatures in Oklahoma have risen less than 1°F (Figure 1)**.** Temperatures in the past decade have been higher than in the previous 40 years and have approached the levels seen during the 1950s and the 1930s Dust Bowl era, when poor land management likely exacerbated the hot summer temperatures. The recent warming has been concentrated in the winter and spring, while summers have not exhibited substantial warming until the most recent 5-year period (2010–2014), a feature characteristic of much of the Great Plains and Midwest (Figure 2). The lack of summer warming is reflected in the mostly below average number of extremely hot days (maximum temperature above 100°F) in recent years (Figure 3a) and the lack of an overall trend in extremely warm nights (minimum temperature above 80°F) (Figure 3b). However, both measures have been above average in the last 5 years. The winter warming trend is reflected in a below average number of very cold nights (minimum temperature below 0°F) since 1990 (Figure 4).

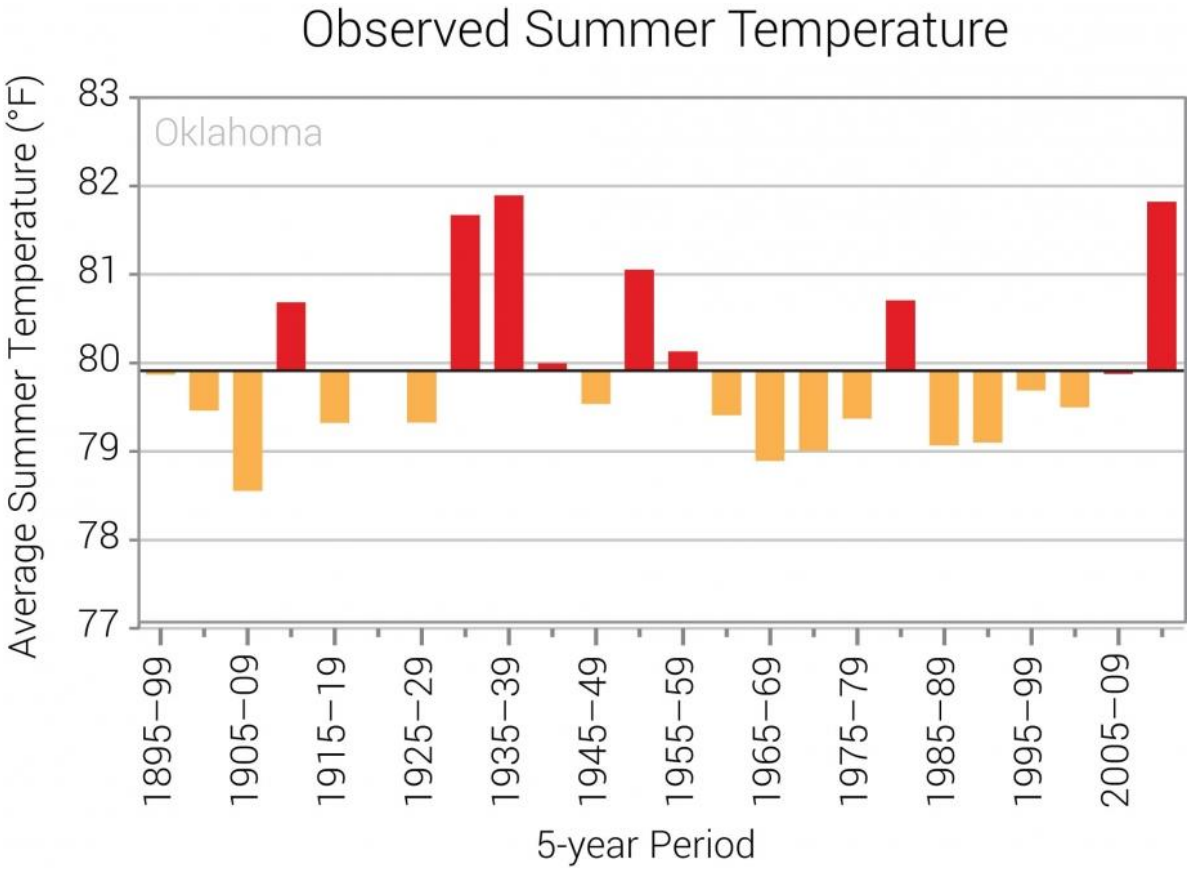


Figure 2: The observed average summer temperatures for 1895–2014, averaged over 5-year periods; these values are averages from NCEI's version 2 climate division dataset. Summer temperatures during the most recent 5-year period (2010–2014) have almost reached the same level as the record extreme heat of the 1930s Dust Bowl era. Due to extreme drought and poor land management practices, the summers of the 1930s remain the warmest on record. The dark horizontal line on each graph is the long-term average of 79.9°F. Source: CICS-NC/NOAA NCEI.

Figure 3

FIGURE 3A

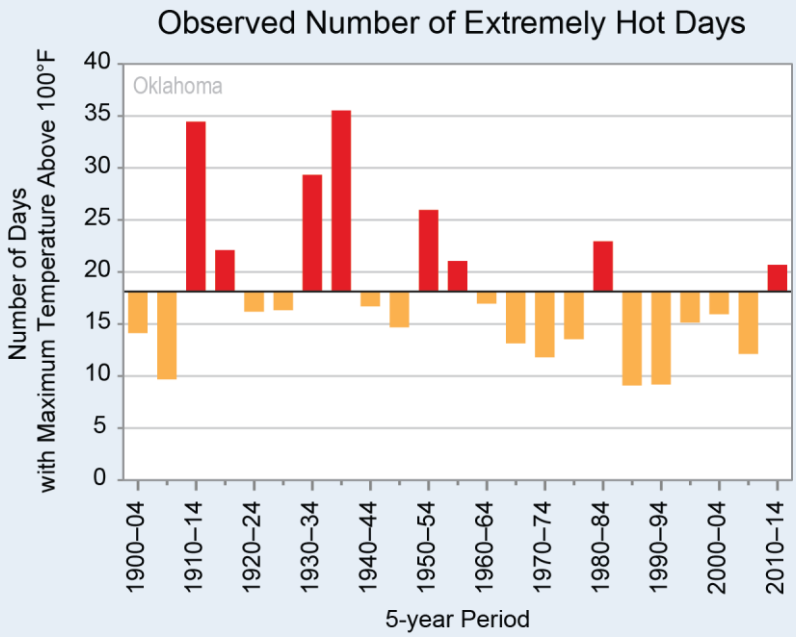


FIGURE 3B

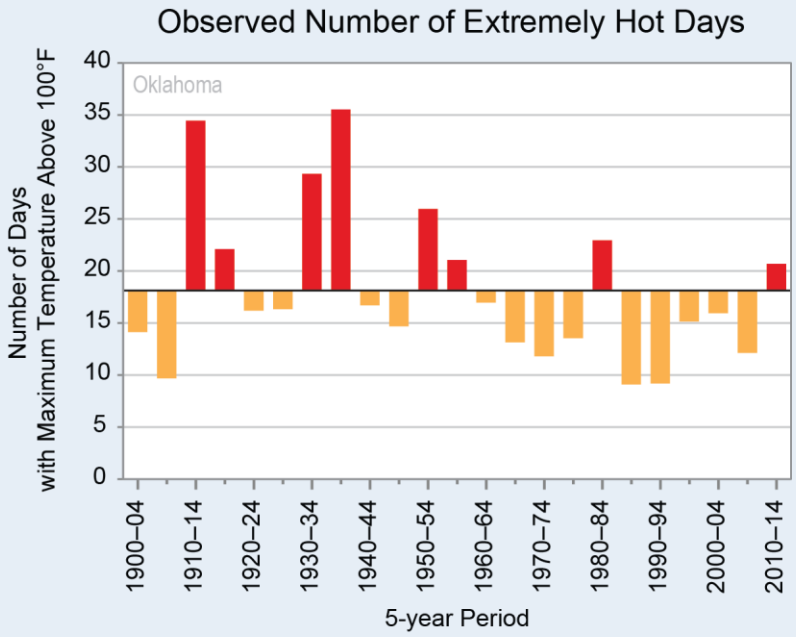


FIGURE 3C

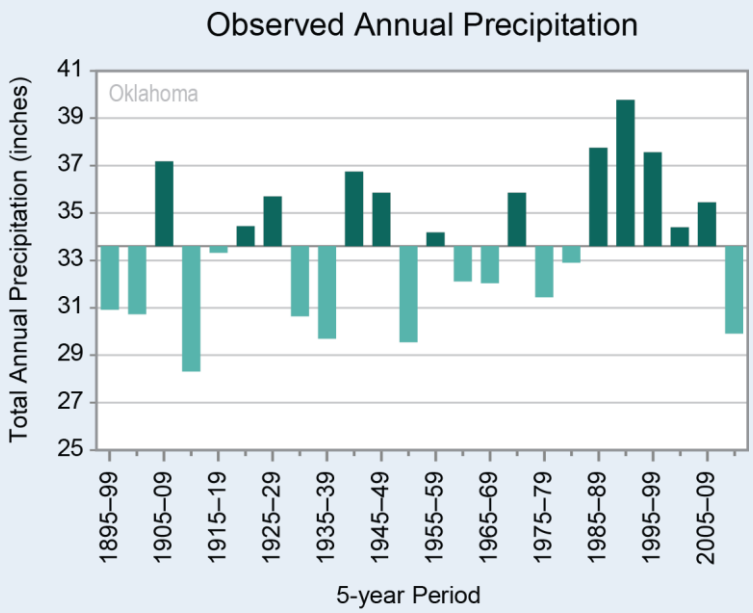


FIGURE 3D

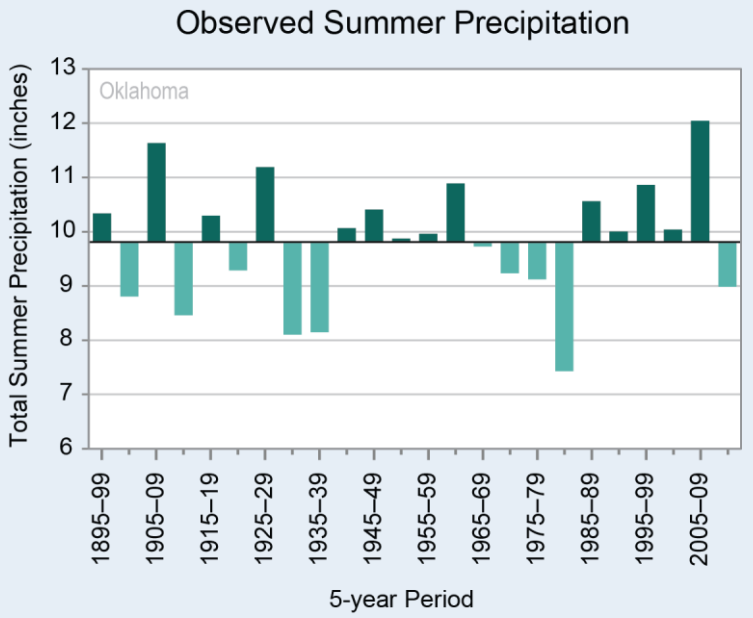


Figure 3: The observed annual average number of (a) extremely hot days (days with maximum temperature above 100°F), (b) extremely warm nights (days with minimum temperature above 80°F), (c) annual precipitation, and (d) summer precipitation, averaged over 5-year periods. The values in Figures 3a and 3b are averages from nine long-term reporting stations. The values in Figures 3c and 3d are from NCEI's version 2 climate division dataset. The dark horizontal line represents the long-term average. The numbers of extremely hot days and extremely warm

nights have been primarily below the long-term average, although the most recent 5-year period has been above average in both categories. Due to extreme drought and poor land management practices, the summers of the 1930s remain the warmest on record. Annual and seasonal summer precipitation have been above average in recent decades, except for the most recent 5-year period, which was drier than normal, reflecting the severe multi-year drought in the state. Source: CICS-NC and NOAA NCEI.

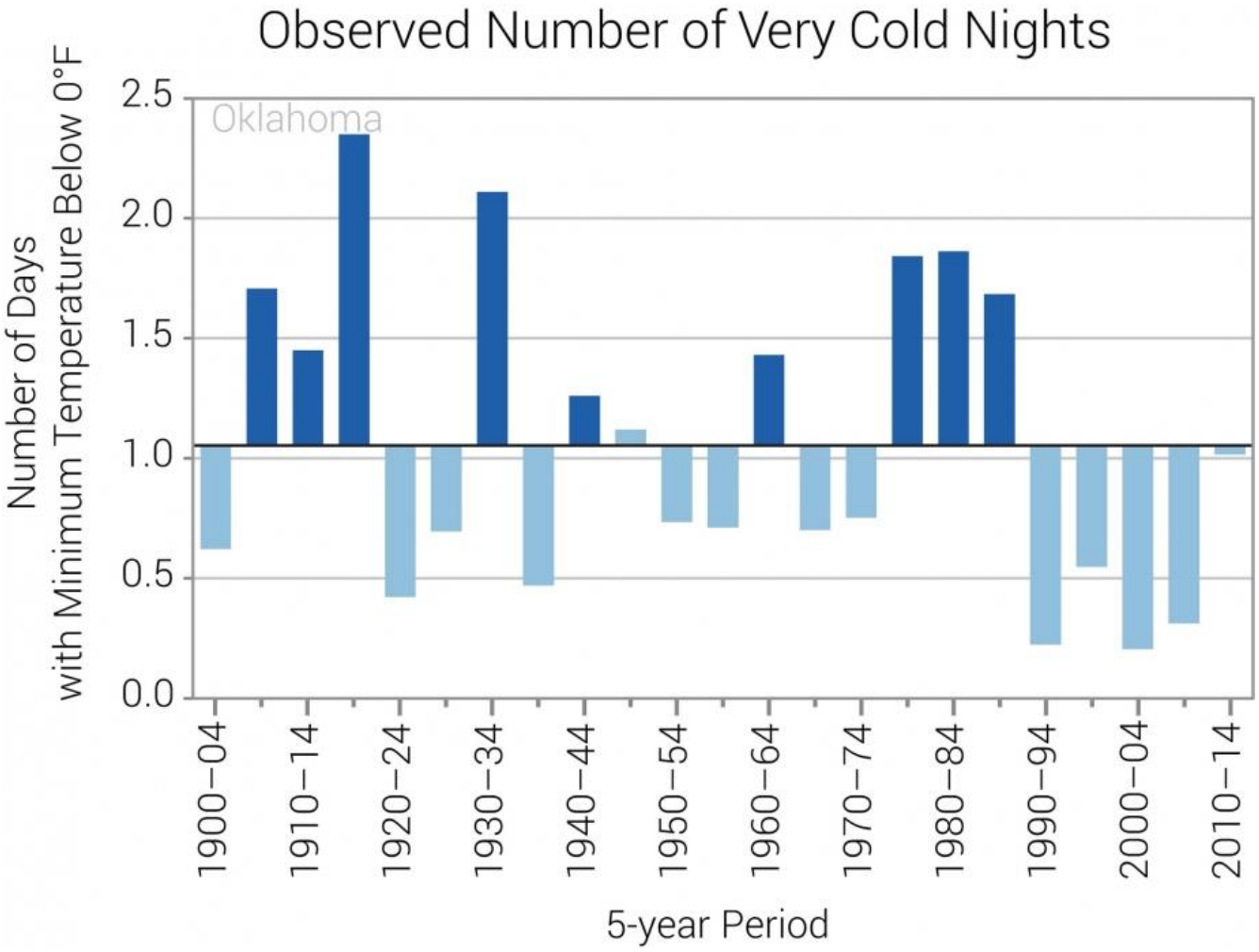


Figure 4: The observed number of very cold nights (annual number of days with minimum temperature below 0°F) for 1900–2014, averaged over 5-year periods; these values are averages from nine long-term reporting stations. Since 1990, Oklahoma has consistently experienced a below average number of very cold nights, indicative of winter warming in the region. The dark horizontal line on each graph is the long-term average of 1.1 days per year. Source: CICS-NC and NOAA NCEI.

Precipitation is highly variable from year to year, with the statewide annual average ranging from a low of 20.32 inches in 1910 to a high of 47.88 inches in 1957. The driest multi-year periods were in the 1910s, 1950s, and 1960s, and the wettest in the 1990s (Figure 3c). The driest 5-yr period was 1952-1956 and the wettest was 1990-1994. The majority of precipitation falls during the spring and summer months. Summer precipitation was below average during the most recent 5-year period (2010–2014) (Figure 3d). Annual snowfall ranges from less than 2 inches in the extreme southeast to almost 30 inches in the Panhandle. Oklahoma regularly experiences freezing rain, particularly in the southeastern part of the state. **The frequency of extreme precipitation events (more than 2 inches of precipitation) has increased, with the past three decades seeing the highest number of events in the historical record** (Figure 5).

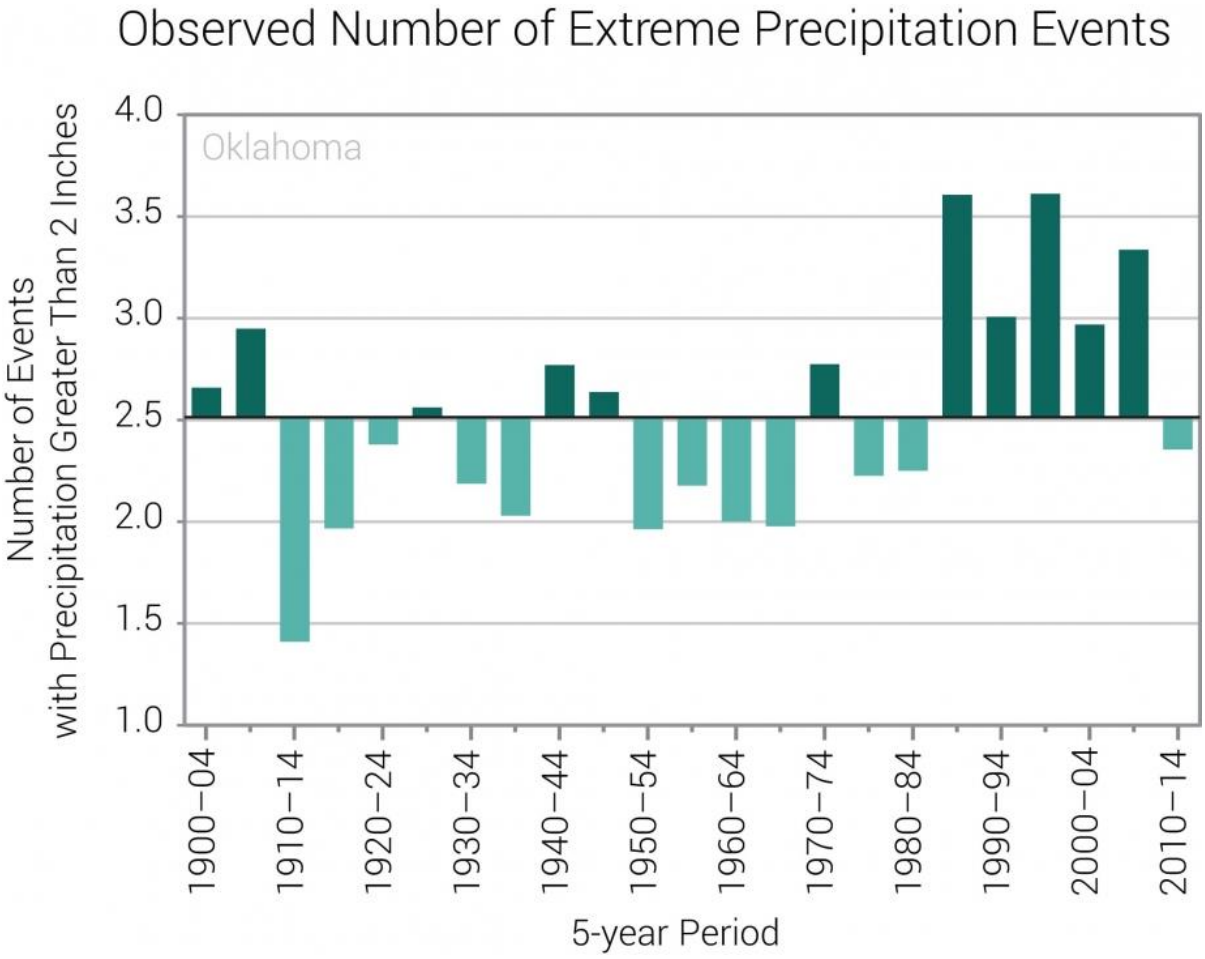


Figure 5: The observed number of extreme precipitation events (annual number of events with precipitation above 2 inches) for 1900–2014, averaged over 5-year periods; these values are averages from 16 long-term reporting stations. Oklahoma has experienced an above average number of extreme precipitation events since 1985, with the exception of the most recent period (2010–2014). The dark horizontal line on each graph is the long-term average of 2.5 events per year. Source: CICS-NC and NOAA NCEI.

Severe thunderstorms are common in Oklahoma due to the state's geography, which allows cold, dry air from the north and west to clash frequently with warm, moist air from the Gulf of Mexico. Oklahoma experiences approximately 45 to 60 thunderstorm days each year. These storms frequently produce tornadoes: during 1985–2014, Oklahoma averaged 56 tornadoes and 4 fatalities per year. Tornadoes are most frequent during April and May. The state's deadliest tornado occurred on April 9, 1947, killing more than 100 people and injuring more than 700. On May 3, 1999, a supercell thunderstorm spawned more than 60 tornadoes, the largest outbreak ever recorded in the state. One of these tornadoes caused F4–F5 damage in Bridge Creek, Newcastle, Moore, and Oklahoma City, destroying 1,800 homes and causing 36 direct fatalities. On May 20, 2013, the same area was struck by yet another EF5 tornado, which killed 24 people and caused over $2 billion in damages.

Droughts are a frequent and severe hazard in Oklahoma (Figure 6). A severe drought occurred in 2011, with the state experiencing its third driest January–October on record, receiving only 19.38 inches of precipitation—more than 10 inches below the long-term average. Although winter precipitation brought some relief to the drought conditions, extremely dry and hot conditions in 2012 once again brought widespread drought conditions to the area. By the end of September, more than 95% of the state was experiencing extreme drought conditions. Since the creation of the United States Drought Monitor Map in 2000, Oklahoma has only been completely drought-free for approximately 21% of the time, and has had at least 50 percent or more drought coverage for approximately 31 percent of the time. **In addition to devastating impacts on the agricultural economy, severe droughts also increase the risk of wildfires.** In 2011, wildfires burned more than 132,000 acres in the state.

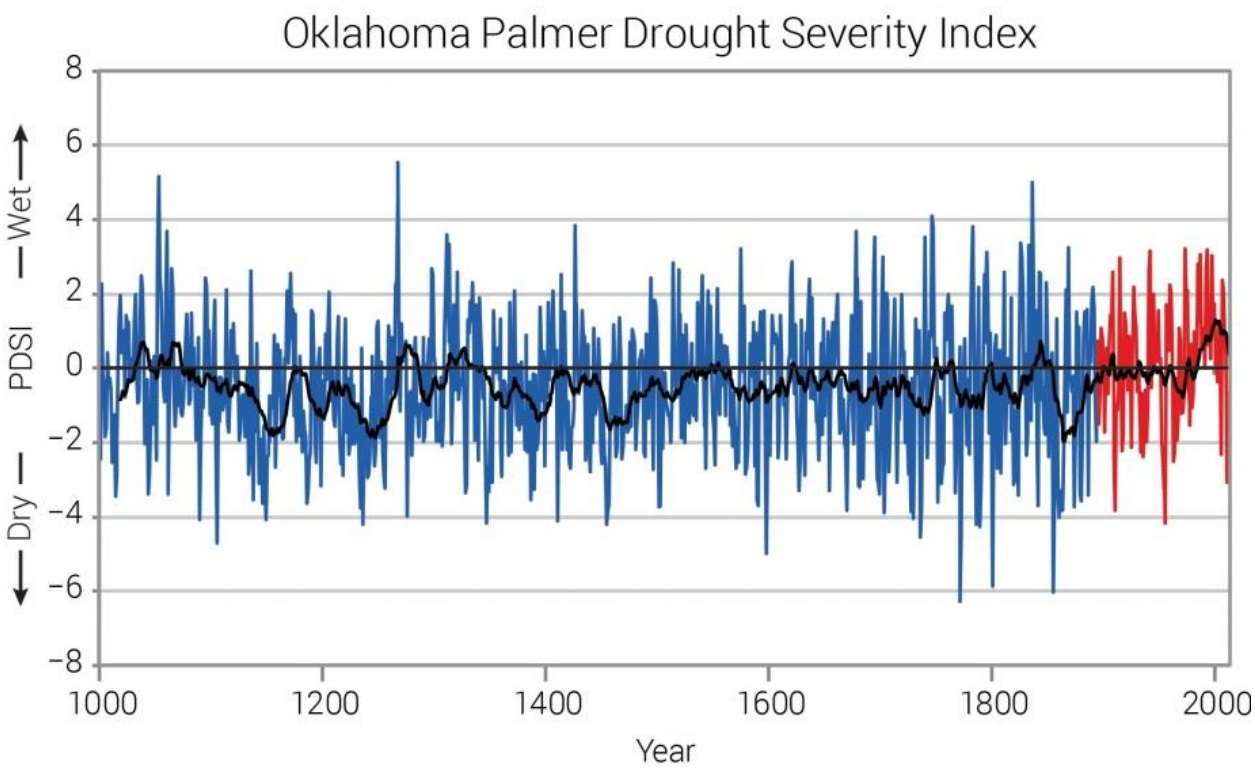
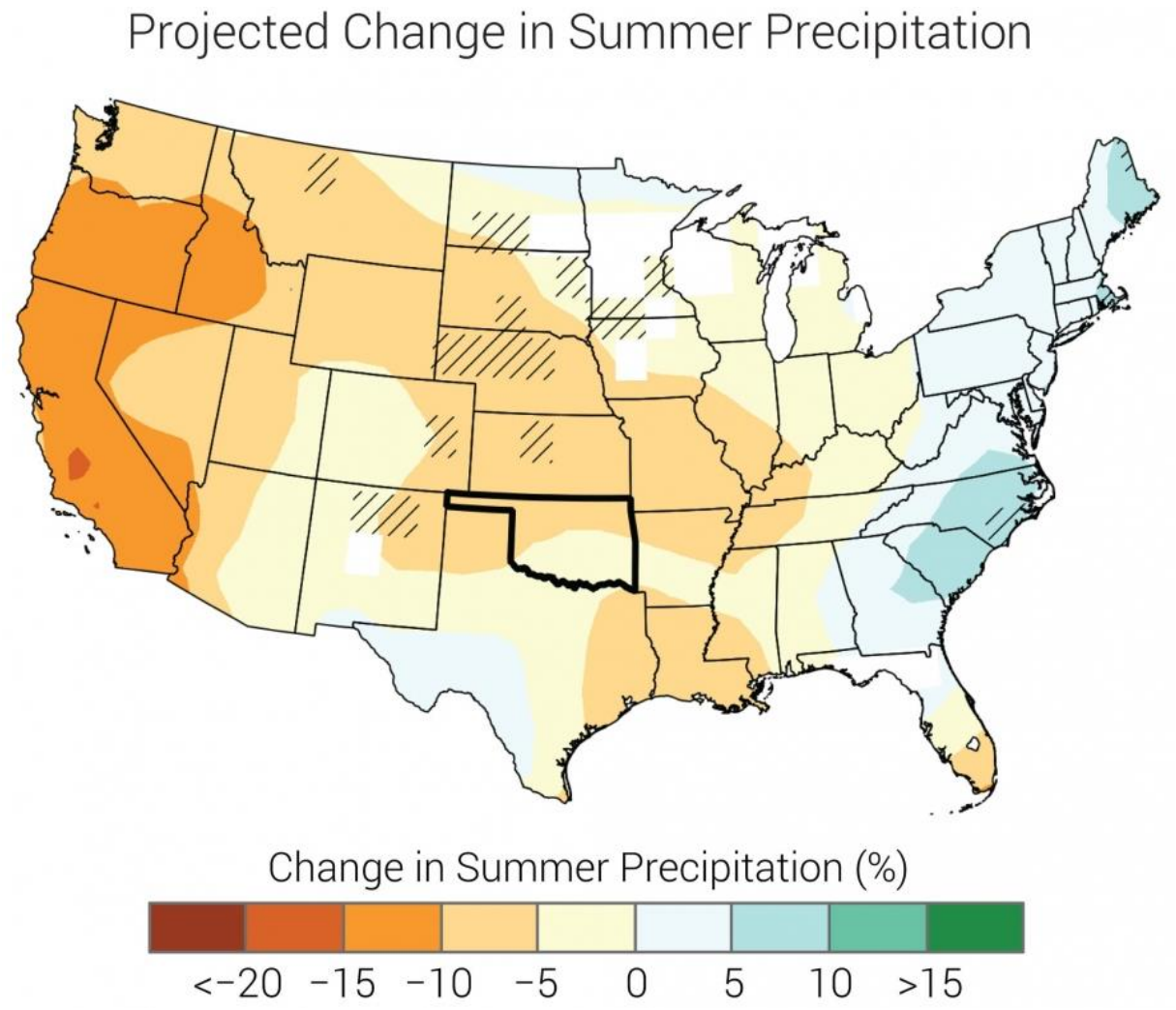


Figure 6: Time series of the Palmer Drought Severity Index from the year 1000 to 2013. Values for 1895–2013 (red) are based on measured temperature and precipitation. Values prior to 1895 (blue) are estimated from indirect measures such as tree rings. The thick solid line is a running 20-year average. In the modern era, the wet periods of the 1980s and 1990s and the dry periods of the 1930s and 1950s are evident. The extended record indicates periodic occurrences of similar extended wet and dry periods. Source: CICS-NC and NOAA NCEI.

Under a higher emissions pathway, historically unprecedented warming is projected by the end of the 21st century (Figure 1). Even under a pathway of lower greenhouse gas emissions, average annual temperatures are projected to most likely exceed historical record levels by the middle of the 21st century. However, there is a large range of temperature increases under both pathways, and under the lower pathway, a few projections are only slightly warmer than historical records. If large increases in temperature occur, future heat waves are likely to be more intense while cold waves are projected to become less intense.

Projections of overall annual precipitation are uncertain. **Although summer precipitation is projected to decrease slightly across the state** (Figure 7), **the decreases are smaller than natural variations**. Even if summer precipitation remains the same, higher temperatures will increase evaporation rates and decrease soil moisture. **Thus, the intensity of future droughts, a natural part of Oklahoma's climate, is projected to increase**. Increased drought intensity, along with decreased summer precipitation, will also increase the risk of severe wildfires.



CHAPTER FOUR: MITIGATION STRATEGY AND PRIORITIES

4.1 Goals to Reduce/Avoid Long-Term Vulnerabilities from Identified Hazards Element (S8)

In 2003, Oklahoma Governor Brad Henry recognized the resilience of Oklahomans when he stated: ***"Our fellow citizens deserve opportunity, safety and security -- no matter where they reside within the borders of our state. We Oklahomans are known for our ability to weather any storm. The pioneers who settled this land were strong in spirit and determination. We are rightly renowned around the world for our compassion and the way in which we band together in the face of challenges. Tragedy brings out the best of the Oklahoma character. We know all too well the potential dangers of springtime and tornado season. Oklahomans came to the aid of their friends and neighbors hit hard by the May 3, 1999, tornadoes. Nature can be cruel, but Oklahomans are a resilient people, and face crises with strength and resolve."***

Governor Henry's ambitious 2004 initiative included forging ***"Partnerships for a safer future through a process of coordination between the private sector, volunteer organizations, individuals and families, and all levels of government."*** Governor Henry's comments contributed to the formulation of the goals expressed in the 2011 State of Oklahoma Hazard Mitigation Plan which were intended to be applicable over a long period of time. They were:

1. To protect life
2. To protect property
3. To protect the environment
4. To increase public preparedness for disasters

In the 15 years since Governor Henry's remarks, Oklahoma has faced a series of natural disasters that have tested the State's capacity to mitigate, prepare, respond and recover. The original goals however, as reviewed by the State Hazard Mitigation Team and OEM's HM planning review staff for this update, were determined to be valid, and further support the State's initiative to unite pre-disaster and post-disaster hazard mitigation as a whole, rather than as two separate efforts.

The goals were also evaluated taking into account the occurrences of hazards and improvements in technology, but the basic goals of the Plan remain the same. Further detail of the goals follows.

The State of Oklahoma Hazard Mitigation Team has identified twelve natural hazards that threaten life and property (see Chapter Three). The threat each poses to human life varies, depending on factors such as knowledge of the hazard, locations of areas most at risk, frequency of hazard event occurrence, population density within the hazard zone, the availability of warning systems, and whether first responders have necessary training and equipment.

4.2 Process Used to Prioritize Mitigation Actions Element S9

S.T.A.P.L.E.E. - Prioritization and Review Criteria for State

Evaluation Category	**Sources of Information and Considerations**
Social	Over 30 state, federal, local and non-profit agencies were contacted and had input throughout the planning process. While many were team members, others participated by identifying potentially vulnerable facilities, resources they were able to contribute, and efforts each agency is making to integrate mitigation in their operations. Approved local natural hazard mitigation plans were incorporated wherever possible. The selected mitigation actions/projects were considered to do the most good for the largest amount of people without adversely affecting any significant section of the population.
Technical	The following persons/agencies were consulted as to the technical feasibility of the various projects: FEMA, NWS, USACE, US Fish & Wildlife, USGS, HUD, BIA, US Bureau of Reclamation, American Red Cross, OKACCO, ODAFF, OCS, and ODOC, OK Cons. Comm., OK Corp. Comm., OEMA, ODEQ, OFMA, OGS, OK Dept. of Health, SHPO, OK Dept. of Human Services, OK Ins Comm., OML, ODOT, OWRB, State NFIP Coordinator, State Dam Safety Cord., ODWC. The mitigation actions/projects implemented were also based upon the judgments of these experts and existing literature/studies regarding the hazards and technically feasible mitigation actions for repetitive loss properties. It was felt the selected actions/projects would provide the best long-term solutions and have minimal secondary impacts**.**
Administrative	Based upon available funding, capability assessment and organizational responsibilities, staffing for implementation of the state plan will rely on existing personnel in OEM and members of the SHMPC.
Political	Representatives from state, federal, local and non-profit agencies attended the SHMPC meetings and were consulted on all aspects of the plan and mitigation actions/projects and provided input.
Legal	The State Natural Hazard Mitigation Plan was made available to all state agencies, governing bodies, and promulgation authorities. In their opinion, no significant legal issues were involved in the state mitigation strategies/actions that were selected.
Economic	Economic issues were discussed by all involved. It was felt that based upon the state's benefit-cost analysis methodology, economic impact assessment, priorities and funding capabilities the mitigation actions/projects selected would do the most good at eliminating or reducing loss of life, repetitive loss properties and other property, help break the cycle of damage, reconstruction,

Evaluation Category	Sources of Information and Considerations
	and repeated damage and have the most benefits. Each project is subjected to a cost benefit review.
Environmental	All environmental concerns are addressed through their respective state agencies before any mitigation actions/projects are undertaken at the state or local level. Coordination with state and federal resource agencies during the formation of the plan and before any mitigation actions/projects are implemented insures compliance with all relevant statutes and regulations.

Mitigation Project Selection

Eligible Applicants

- State and local governments.
- Private non-profit organizations and institutions that own or operate a private nonprofit facility as defined in 44 CFR Part 206.221(e).
- Indian tribes or authorized tribal organizations

Sub-recipients must have a FEMA approved Hazard Mitigation Plan at the time of award as outlined in 44 CFR 201.6.

Identification and Notification of Potential Applicants

Information on the Hazard Mitigation Grant Program is widely disseminated through multiple sources such as by phone, e-mail, internet, and press releases.

Potential applicants will be directed to the OEM website at www.oem.ok.gov for information on available Hazard Mitigation Assistance programs and pre-application and application deadlines.

The OEM Area Coordinators, who are the local points of contact for emergency management activities, will also disseminate information on the program. Local Emergency Managers and Floodplain Administrators will be emailed the details on the program briefings and application announcements

Mitigation staff will attend OEM area meetings to discuss hazard mitigation issues and new opportunities for funding. In addition, coordination with the Association of County Commissioners of Oklahoma and the Oklahoma Municipal League will serve to notify county and city personnel on the availability of mitigation funds.

Eligible Projects

Projects may be of any nature that will result in meeting the mitigation goals of the local Hazard Mitigation plan and the overall State Mitigation Goals. These projects are developed from the goals and mitigation actions that form the basis of local hazard mitigation plans. During the development and update of a local hazard mitigation plan, local communities identify those hazards that have the highest risk potential. This hazard analysis identifies benchmark events in those planning areas that have the greatest impact. For example; the 2013 Moore Ok Tornadic event that impacted an elementary school, the 2015 Statewide Flooding the significantly impacted southern counties of Oklahoma and the 2018 Wildfires in Northwestern Oklahoma. These events are used to update the local hazard mitigation plan, and to assist OEM in conducting mitigation outreach and project development. Local communities are encouraged to follow the mitigation actions that will best meet their stated goals for their community, with the collective goals of these actions building to a local and state resiliency.

Identification of Projects

Projects identified in Local Hazard Mitigation Plans will be the initial source for identifying potential projects. All mitigation projects must be identified or support goals and objectives in federally approved local mitigation Plans. Hazard Mitigation Planners will review all FEMA approved Plans to identify mitigation projects. Information acquired during the Preliminary Damage Assessment (PDA) in response to a disaster event is another source for identification of mitigation issues and potential projects. PDA teams will be briefed as to the availability and requirements of the Hazard Mitigation Grant Program so potential projects can be identified for follow-up by the State Hazard Mitigation Staff.

Review, Priorities, and Ranking of NOIs/ Applications for HMGP, PDM and FMA

Projects that have been submitted to OEM and are currently waiting for funding at the time of a disaster declaration are the highest priority for the State of Oklahoma. Applicants are responsible for prioritizing projects by urgency of the need with the disaster being mitigated, financial impact to the jurisdiction, human losses, and timeframe for completion. The State is responsible for prioritizing each project application with respect to how much and when State assistance is available. For applications not submitted prior to the disaster declaration, priority will be given to flood and severe storm mitigation projects in the effected counties. Those applications that are submitted for Pre-Disaster Mitigation will be prioritized based on the local jurisdiction priority, and then ranked in accordance with the state goals. Flood Mitigation Assistance will be prioritized in accordance with the goals and strategies outlined in the State and Local Repetitive Loss Strategy and goals.

General Review Criteria

Applications for funding under the Hazard Mitigation Grant Program received by the State Hazard Mitigation Section will be reviewed for the following criteria (from 44 CFR 206.434). The following must be provided prior to submitting applications in NEMIS:

- Be in conformance with the State Mitigation Plan and Local Mitigation Plan approved under 44 CFR Part 201;

- Have a beneficial impact upon the designated disaster area, whether or not located in the designated area;

- Be in conformance with 44 CFR Part 9, Floodplain Management and Protection of Wetlands, and 44 CFR Part 10, Environmental Considerations*;*

- Solve a problem independently or constitute a functional portion of a solution where there is assurance that the project as a whole will be completed. Projects that merely identify or analyze hazards or problems are not eligible;

- Be cost-effective and substantially reduce the risk of future damage, hardship, loss, or suffering resulting from a major disaster. The sub-recipient must demonstrate this by documenting that the project:

    - Addresses a problem that has been repetitive, or a problem that poses a significant risk to public health and safety if left unsolved.
    - Will not cost more than the anticipated value of the reduction in both direct damages and subsequent negative impacts to the area if future disasters were to occur.
    - Has been determined to be the most practical, effective, and environmentally sound alternative after consideration of a range of options.

- Contributes, to the extent practicable, to a long-term solution to the problem it is intended to address.

- Considers long-term changes to the areas and entities it protects and has manageable future maintenance and modification requirements.

Statewide Hazard Mitigation Programs

The State may submit applications for Hazard Mitigation Assistance funding as the recipient and sub-recipient. Historically, OEM has applied for and received funds for 21 phases of the SoonerSafe Safe Room Rebate Program. OEM is responsible for administering the SoonerSafe Program. The SoonerSafe program provides homeowners with a rebate of 75% towards the cost of a safe room and installation, not to exceed $2,000. SoonerSafe is contingent on the availability of Federal funds. OEM may, at its discretion, act as sub-recipient for other project types such as, but not limited to: Hazard Mitigation Planning Initiatives, Public Information and Outreach, Mapping Activities, and other mitigation activities.

Five Percent Set-Aside

Sub-applicants will not be awarded more than one grant in the five percent initiative-funding category. The only exception to this is when the State has funded at least one sub-applicant to all jurisdictions in line for funding or there is funding available at the conclusion of the application period. Additionally, for siren and generator projects, funding will may be limited dependent on the number and size of project applications that have been submitted. Should OEM initiate a cap on Initiative funds, caps may be instituted at the following amounts; maximum federal share available for generators funded under the five percent initiative will be $50,000. Maximum federal share available for sirens funded under the five percent initiative will be $60,000. These caps may be waived upon request of the jurisdiction and approval of OEM.

7-Percent Planning Grants

Grants are available to municipalities with a population greater than 25,000. Counties of any population size are eligible for Mitigation Planning funds. OEM encourages all Counties to work with their respective local jurisdictions including local communities and schools to be incorporated into the Planning process. Counties may apply to roll single jurisdictions into the county Plan as time permits.

Hazard Mitigation Planning Grant Funding

Community Type	**Population**	**Maximum Award (Total Project)**
Rural County Multi-Jurisdictional	Less than 25,000/	$50,000
Midsize County Multi-Jurisdictional	25,000-200,000/	$80,000
Midsize City Single-Jurisdictional	25,000-200,000/	$80,000
Urbanized County, **Metropolitan Area**, **Large City, or Regional Plan (multi-county)**	Greater than 200,000/	$200,000

Hazard Mitigation Planning Grants must be based on actual needs of the jurisdiction. Factors affecting the range of costs:

- Technical sophistication of scope of work
- Number and size of participating jurisdictions
- Number of significant hazards affecting Planning area
- Variance of hazards/risk across Planning area

- Update or new Plan (costs of first round updates may be similar to new Plans depending on quality of original Plan; second round updates should start significantly decreasing)
- Post disaster (more to analyze – higher cost)

Fire Management Assistance Grants (FMAG)

• OEM will prioritize HMGP Post Fire assistance to Wildfire Mitigation projects first within the first 90 days of the application period. Following the 90 day initial period, HMGP eligible projects will be made available to eligible sub-applicants statewide. OEM will coordinate with OEM regional Representatives and through the State Hazard Mitigation Team to announce funding. Deadlines for applications will be within the guidance set by the FMAG-HMGP requirements.

4.3 State Mitigation Actions Element (S9)

The strategies identified below in the Hazard Mitigation Initiatives are activities and programs are those that OEM and partner agencies are currently engaged with to facilitate mitigation actions throughout the state. The table below uses a strategy and action basis to provide pathway to meeting the mitigation goals.

Hazard Mitigation Initiatives to Protect Life					
Strategy	Action	Projected Timeline	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy
Every public school should have a tornado shelter or designated safe room	Develop an inventory of public schools with safe rooms or shelters, and those that lack any sheltering facilities.	Ongoing	HMGP, PDM	By identifying schools that lack shelters, efforts can be initiated in communities to raise awareness and funding for shelter construction or retrofitting of existing buildings.	Use of tornado shelters prevents injuries and saves lives.
Provide a reliable state-wide emergency communications method	Plan and implement user training sessions and tests of **WebEOC** simulating various disaster scenarios.	Ongoing	Existing State and local resources	Communities rely on the **WebEOC** network to coordinate emergency response activities.	**WebEOC** enables real-time information sharing which is vital in the deployment of regional resources during emergencies and disaster events to save lives and property.
	Sponsor and conduct annual NFIP courses for	FEMA Moon-shoot	CAP-SSSE	Educate community stakeholders on the importance of floodplain	Education of the public along with local enforcement of NFIP regulations

Hazard Mitigation Initiatives to Protect Life					
Strategy	Action	Projected Timeline	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy
Promote increased awareness of, and participation in NFIP	floodplain professionals	2017-2020		management, NFIP regulatory and administrative requirements, and the benefits of NFIP participation.	ultimately reduces the risk of exposing residents to flood-prone areas.
Provide site-specific emergency preparedness instruction for school administrators	Continue the all-hazard All Hazard Emergency Preparedness for Public Education program.	Ongoing	Oklahoma Insurance Department	State schools do not have a standard protocol for ensuring safety of students and staff in the event of natural disasters, school violence, or need for campus lock-downs.	Having plans, and conducting drills so that teachers and staff know exactly how to move school building occupants to safety and work with first responders, will reduce injuries and save lives.
Promote enforcement of State and local building codes	Promote enforcement of existing building codes by State and local governments.	Ongoing	State and local resources	Oklahoma has adopted stringent building codes, but enforcement is the responsibility of local government.	Conformance to minimum construction standards ensures stronger, safer buildings which, in turn, contribute to the safety of the public.
Statewide Individual Safe Room Rebate	Continued implementation and administration of statewide	Ongoing	HMGP, PDM	By identifying individuals whom lack a safe room on eligible properties, provide	Use of tornado shelters prevents injuries and saves lives.

Hazard Mitigation Initiatives to Protect Life					
Strategy	Action	Projected Timeline	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy
Program ("SoonerSafe")	individual safe room rebate program.			protection from severe storms and tornadic events.	

Hazard Mitigation Initiatives to Protect Property					
Strategy	Action	Projected Timeline	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy
Protect critical State-owned assets	Prioritize structural and non-structural retrofits for critical State-owned facilities based on their vulnerability to natural hazards.	Ongoing	Capital budget funds, HMGP	Prioritizing the facilities will provide direction for timely upgrades pending availability of funding.	Retrofitting facilities will preserve State buildings, as well as protect their contents and occupants from hazard events.
Identify vulnerabilities of transportation infrastructure	Examine the vulnerability of transportation infrastructure and develop contingencies for	Ongoing	Existing and future State resources.	By studying past events and known vulnerabilities and projecting this data to future events, contingency plans can be developed for overcoming failures in transportation infrastructure.	Identifying potential infrastructure weaknesses enables stakeholders to plan solutions before the failures occur, and to allocate resources proactively.

Hazard Mitigation Initiatives to Protect Property					
Strategy	Action	Projected Timeline	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy
	alternate operations.				
Inform citizens of need for flood insurance	Encourage renters, homeowners, and business owners to purchase flood insurance even if their property is not located within high flood risk areas.	Ongoing	Existing and future State resources.	Many people do not realize that most homeowners and business insurance policies do not cover flood losses; also renters may not realize that they are eligible to purchase flood insurance through NFIP.	While having insurance doesn't mitigate the flooding event, having flood insurance helps deter catastrophic financial losses and reduces the possibility of blighted, abandoned properties which erodes the property value of adjacent areas.

Hazard Mitigation Initiatives to Protect the Environment					
Strategy	Action	Projected Timeline	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy
Bury electric transmission lines	Work with electric utilities to explore development of underground lines in high-risk areas, including fire interface areas.	Ongoing	Existing resources	Electric transmission lines protected in underground conduits are not susceptible to damage from fire, fallen trees or snow loads.	Buried electric lines can't create sparks that can cause fires, nor are they vulnerable to damage from wildfires.
Establish Firewise Communities	Promote establishment of Firewise Communities Program throughout State	Ongoing	Existing resources	The mission of the Firewise Communities Program is to protect people and property in communities at risk for wildfires.	By educating residents about the hazards of wildfires and how they can make their property fire-resistant, this program has a proven record of success in protecting lives, property, and the environment.

Hazard Mitigation Initiatives to Increase Public Preparedness					
Strategy	Action	Projected Timeline	Projected Resources	Rationale for Action	How Action Contributes to Mitigation Strategy
Increase stakeholder knowledge of Hazard Mitigation Planning	Encourage local jurisdictions to prepare local Hazard Mitigation plans for FEMA approval.	Ongoing	Existing resources	Preparing and maintaining local plans leads to increased awareness of Hazard Mitigation issues through public forums and continued dialog.	Improving knowledge of the State's hazards and the risks they pose will lead to development of better policies and improved funding for hazard reduction strategies.
Improve public knowledge of hazards and protective measures so individuals appropriately respond during hazard events	Assess the State's public school education program on emergency preparedness and disaster resistance to determine its effectiveness and establish a baseline for future education efforts.	Ongoing	Existing program resources, State mitigation programs	There is no standardized awareness program to make school officials aware of potential hazards and how to respond to them.	Educating school officials about potential hazards and how to respond before, during, and after events will lead to effective preparedness programs.
Educate the public about the risks of wildfires in urban areas that abut undeveloped areas	Develop and maintain a public education program for awareness of the wildland fire risk and promotes actions that reduce the risk of fire to life and property.	Ongoing	Existing resources	Development in interface areas is increasing but property developers and residents need to be aware that the risk for wildfires is not limited to undeveloped, rural areas.	Increasing the knowledge of the public, property developers and local planners of the wildland fire risk and mitigating that risk will improve

					public safety in interface areas.
Improve hazard information including databases and maps	Develop and maintain an inventory of existing geographical databases for natural hazards.	Ongoing	Existing and additional resources	Many land-use planners and emergency managers do not know where to turn for geographical (GIS) databases for hazards or whether such a database exists.	Maintaining a centralized library of hazard databases will improve their accessibility and expand their use by land-use planners and emergency managers, resulting in better plans and mitigation initiatives.
Create a GIS database of areas within the state that are prone to natural hazards for fast and easy access	Accelerate mapping of natural hazard areas, including floods, and develop GIS-compatible database products for them.	Ongoing	Dependent on continued funding	Few GIS databases for natural hazards exist.	Availability of GIS databases for natural hazards would greatly improve mitigation initiatives and consequent land-use planning.
Create a GIS database of state critical assets required to meet ESF functions within the state that are prone to natural hazards.	Data collection of state critical assets and natural hazard areas, including floods, and develop GIS-compatible database products for them.	Ongoing	Dependent on continued funding	Initial dataset of assets is available, ESF partners would provide a ranking of those assets required to meet their ESF support function.	Availability of GIS databases for critical assets of ESF partners would greatly improve mitigation initiatives and consequent land-use planning.

4.4 Hazard Mitigation Actions Funding Sources Element (S10)

The State of Oklahoma has a variety of programs available to assist with funding for hazard mitigation projects. They include but are not limited to the following:

Hazard Mitigation Grant Program (HMGP)

The Hazard Mitigation Grant Program (HMGP) was created in 1988 by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended. This program is activated during Presidential Disaster Declarations to assist in identifying mitigation projects, and funding these projects on a 75% Federal / 25% non-Federal cost share basis. The program is administered at the State level; in Oklahoma, through Emergency Management. Note: In Oklahoma, the 25% share is normally absorbed by the local, city or county government.

- Objectives of this program include: Prevent future loss of lives and property due to disasters; implement State or local hazard mitigation plans; enable mitigation measures to be implemented during the immediate recovery of a disaster; and, provide funding for previously identified mitigation measures that benefit the disaster area.
- Eligible applicants for the HMGP are: State and local governments; certain non-profit organizations; and Indian tribes.

The HMGP is designed to reduce the State's or local government's vulnerability to risk through a thoroughly coordinated all-hazards approach to mitigation activities, with a heavy emphasis on planning. This focus on planning includes updating plans; implementing the measures identified in all-hazard mitigation plans; developing local mitigation plans; developing State legislation; or adopting local ordinances. The key here is the coordination and implementation of an all-hazards approach using a strong partnership at the State and local level.

Hazard Mitigation Grant Program Post Fire (HMGP-PF)

Hazard Mitigation Grant Program for Post fire is mitigation funding that has been made available to the state as a result of Fire Management Assistance Grant declarations in fiscal years 2017 and 2018 as authorized in Section 20602 of the Bipartisan Budget Act of 2018.

HMGP Post Fire utilizes existing HMA Guidance with the following exceptions:
• A Fire Management Assistance declaration rather than a Presidential major disaster declaration activates HMGP assistance.

• OEM will prioritize HMGP Post Fire assistance to Wildfire Mitigation projects first, then those HMGP eligible projects will be made available to eligible sub-applicants statewide. OEM will coordinate with OEM regional Representatives and through the State Hazard

Mitigation Team to announce funding. Deadlines for applications will be within the guidance set by the FMAG-HMGP requirements and the State Admin plan for HMGP.

• The HMGP funding amounts are based on a national aggregate for each Fire Management Assistance declaration and HMGP assistance shall be aggregated under the first Fire Management Assistance declaration. The total amount available for HMGP for states and tribal applicants with standard state or tribal hazard mitigation plans is $425,008 for each Fire Mitigation Assistance declaration, and $566,667 for applicants with enhanced state or tribal hazard mitigation plans.

• The application period is 6 months from the date of applicant (state, territory, or federally-recognized tribe) funding notification and extensions may be requested.

Pre-Disaster Mitigation (PDM) Program

FEMA has long been promoting disaster resistant construction and retrofit of facilities that are vulnerable to hazards in order to reduce potential damages due to a hazard event. The goal is to reduce loss of life, human suffering, economic disruption, and disaster costs to the Federal taxpayer. This has been, and continues to be, accomplished through a variety of programs and grant funds.

Although the overall intent is to reduce vulnerability before the next disaster threatens, the bulk of the funding for such projects actually has been delivered through a "post-disaster" funding mechanism, the Hazard Mitigation Grant Program (HMGP). This program has successfully addressed the many hazard mitigation opportunities uniquely available following a disaster

Through the Disaster Mitigation Act of 2000, Congress approved creation of a national Pre-disaster Hazard Mitigation program to provide a funding mechanism that is not dependent on a Presidential disaster declaration. This authorization is in Section 203 of the Stafford Act, 42 USC 5121-5206, as amended by Section 102 of the Disaster Mitigation Act of 2000. For FY2002, $25 million was appropriated for the new grant program entitled the Pre-Disaster Mitigation Program (PDM).

The high points of the PDM program are:

(1) The program will be administered by each State.

Eligible projects include:

- State and local hazard mitigation planning
- Technical assistance (e.g. risk assessments, project development)
- Mitigation Projects
- Acquisition or relocation of vulnerable properties
- Hazard retrofits

- Minor structural hazard control or protection projects
- Community outreach and education (up to 10% of State allocation)

(2) Each State establishes grant selection criteria and priorities based on:

- The State Hazard Mitigation Plan
- The degree of commitment of the community to hazard mitigation
- The cost effectiveness of the proposed project
- The type and degree of hazard being addressed

(3) For Elevation project grants, a "good standing" of the community in the National Flood Insurance Program (NFIP) is required.

(4) The funding is 75% Federal share, 25% non-Federal, except as noted below.

- The non-federal match can be fully in-kind or cash, or a combination
- The grant performance periods will be 18 months for planning grants, and 24 months for mitigation project grants
- The PDM program is available to regional agencies and Indian tribes

(5) Special accommodation will be made for "small and impoverished communities," that will be eligible for 90% Federal share, 10% non-Federal.

Flood Mitigation Assistance (FMA) program

The Flood Mitigation Assistance program is a State administered cost-share program through which States and local communities can receive grants for flood mitigation planning; flood mitigation projects; and FMA technical assistance. It is a Federal grant program, similar to the Hazard Mitigation Grant Program; however, FMA provides assistance to States and communities for flood mitigation planning and activities to fund cost-effective measures that reduce or eliminate the long-term risk of damage to buildings, manufactured home, and other NFIP-insurable structures in some cases by providing funds for acquisitions and removal or Repetitive loss and Severe Repetitive loss properties, and it is not disaster dependent. Note: In Oklahoma, the 25% local share will be absorbed by the local, city or county government, and one-half of the 25% (or 12.5% of the total grant) share must be a "hard match."

(1) FMA is part of the National Flood Insurance Act of 1968, Sections 1366 and 1367 as amended by Sections 553 and 554 of the National Flood Insurance Reform Act (NFIRA) of 1994.

(2) Goals of the program include: Reduce the number of repetitively damaged structures and associated claims against the National Flood Insurance Fund; and encourage long-term comprehensive mitigation planning.

National Flood Insurance Program (NFIP)

The National Flood Insurance Program, enacted in 1968, made federally subsidized flood insurance available to property owners located in communities participating in the flood program. Communities wanting to participate in the National Flood Insurance Program must establish minimum floodplain management regulations in their special flood hazard areas and enforce these regulations.

(1) In 1973, Congress passed the Flood Disaster Protection Act. This law required the purchase of flood insurance as a condition for Federal or Federally-related loans or other Federal financial assistance for property located in identified floodplain areas. This provided the incentive for participation in the Program.

(2) Most counties in the State of Oklahoma lacked proper authority concerning land use regulation necessary to participate in the Flood Insurance Program. In 1980, the legislature passed the Oklahoma Floodplain Management Act to allow citizens that desired to participate in this Program to procure flood insurance. This legislation enables any county or community in the State to form a Floodplain Board and enact floodplain regulations to allow participation in the Program.

(3) The National Flood Insurance Program requires communities to adopt and enforce a minimum amount of floodplain management criteria. These criteria includes such items as: Requiring permits for construction within designated floodplains; reviewing development plans and subdivision proposals to determine if proposed building sites will be reasonably safe from flooding; requiring protection of water supply and sanitary sewage systems to minimize infiltration of flood water and discharges from the system into the flood waters; obtaining, reviewing, and utilizing all available base flood elevation data; and assuring the maintenance of flood carrying capacities within all water courses.

(4) A current list of Oklahoma communities participating in the Program, consists of counties (unincorporated areas), tribes and municipalities, is provided in **Appendix B** of this plan.

Community Rating System

The Community Rating System (CRS) is an element of the NFIP. This program is designed to promote the availability of flood insurance, reduce future flood damages and insure the accurate rating of flood insurance policies. Participating communities may receive credit for proven mitigation measures, thus reducing the cost of flood insurance within their communities.

Disaster Housing Program

The Disaster Housing Program is available to provide disaster hazard mitigation measures in the form of home repair grants to eligible homeowners following a federally declared disaster. If the home repair costs exceed the Disaster Housing Grant, the applicant can be referred to the Individual and Family Grant Program for additional grants not to exceed the maximum grant limitations of the Individual and Family Grant Program.

CAP-SSSE (Community Assistance Program-State Support Services Element)

The State administers the CAP-SSSE Grant available through FEMA. The grant provides funds for assistance to communities participating in the National Flood Insurance Program. This assistance is directed at the administration of each community's floodplain development permit system to insure compliance with flood loss reduction guidelines.

Summary
Changes to FEMA hazard mitigation grant program since the last Plan Update include the elimination of the Severe Repetitive and Repetitive Loss Claim and Repetitive Flood Claim grant programs. To encourage efforts by states and local jurisdictions to reduce repetitive loss damages, FEMA has reduced the cost share requirement for HMA grant funding if the action directly reduces repetitive losses.

4.5 Mitigation Action Items Completed Since 2014 State HM Plan Element (S11)

Since the last update, OEM has focused on mitigation actions and projects that are identified and conducted by local jurisdictions, and are site-specific programs and projects.

State Hazard Mitigation Action Projects/Programs (Past and Present):

In recent years, the Hazard Mitigation Division of OEM has changed its focus from State-sponsored efforts to the support of local governments in developing site-specific programs and projects. The table below is overview of State Mitigation Projects that have been completed and on-going

Description	Associated Hazards	Lead Agency	Schedule / Completion Date
State 911 PSAP Facility Mapping The State is currently using its Emergency Management network to systematically verify each location of PSAP owned and operated facilities.	Dam Failure Earthquake Flooding Tornado Wildfire	Oklahoma Emergency Management (OEM)	OEM-USACE Silver Jackets FY 2018-2019

Description	Associated Hazards	Lead Agency	Schedule / Completion Date
Local Jurisdiction Hazard Mitigation Projects Reverse 911, GIS Mapping, 911 Training, School Safe Rooms, Shelter Models, Acquisitions, Natural Hazard Mitigation Plans, etc.	Dam Failure, Drought, Earthquake, Severe Storms, Soil Hazards, Extreme Heat, Flooding, High Winds, Landslides, Tornadoes, Wildfires, Winter Storms	OEM (funding source only)	Multiple completion dates ranging from one to three years; Ongoing
Tornado Shelter Seminars (Tornado Summit) Oklahoma Emergency Management presents free seminars across the State specifically discussing community and school shelters.	Tornadoes High Winds	OEM	April/May Annually
Hazard Mitigation Planning Workshops Conducts informational sessions throughout the State explaining the value and need for Local HM Plans, why they are important, and options on how to create them.	Dam Failure, Drought, Earthquake, Severe Storms, Soil Hazards, Extreme Heat, Flooding, High Winds, Landslides, Tornadoes, Wildfires, Winter Storms	OEM	Ongoing, conducted quarterly through OEM Regions
March is "Flood Insurance Month" This annual State campaign spreads the word about the availability of FEMA's affordable NFIP flood insurance.	Flooding	OWRB	Every March

Description	Associated Hazards	Lead Agency	Schedule / Completion Date
May is "Flood Awareness Month" This annual State campaign reminds citizens of the dangers of flash flooding.	Flooding	OWRB	Every May
Oklahoma Red Flag Fire Alert This notification program limits the use of outdoor burning during periods of high risk.	Wildfires	Oklahoma Forestry Service	Ongoing
Dam Safety Program This program ensures that the 4,500 dams in the State are inventoried, inspected and properly maintained.	Dam Failure Flooding	OWRB	Ongoing
OK-FIRST Program This communications system has been recognized internationally for its innovative approach in providing instant access to vital weather data for fire, police, and emergency management agencies.	High Winds Thunderstorms Tornadoes Winter Storms	Oklahoma Climatological Survey	Ongoing
Resolve data deficiencies Work with local jurisdictions to assist them in identifying and gathering data that is missing from their plans prior to submission to FEMA.	Dam Failure, Drought, Earthquake, Severe Storms, Soil Hazards, Extreme Heat, Flooding, High Winds, Landslides, Tornadoes, Wildfires, Winter Storms	OEM	Ongoing
Flood Risk Resiliency Projects- Identification of communities that are high risk for flooding, or have been experienced significant damage	Flooding, Dam Breach	USACE, OEM	2-3 communities selected annually.

Description	Associated Hazards	Lead Agency	Schedule / Completion Date
due to flooding. These are funded through the USACE Silver Jackets Program.			

CHAPTER FIVE: STATE MITIGATION CAPABILITIES

5.1 Existing State Pre and Post HM Policies to Mitigate Hazards Element (S12)

Oklahoma's State Hazard Mitigation Team (SHMT)

The SHMT was established by state law in 1999, (63 O.S. §683.6). It receives no direct funding support, and is under the coordination of the State Hazard Mitigation Officer (SHMO). The SMHT is composed of the following agencies:

- Oklahoma Department of Emergency Management, Team Coordinator
- Oklahoma Water Resources Board
- Oklahoma Climatological Survey
- Oklahoma Conservation Commission
- Corporation Commission
- Oklahoma Department of Commerce
- Department of Environmental Quality
- Department of Human Services
- State Department of Health
- Department of Transportation
- Oklahoma Department of Agriculture, Food, and Forestry or the Secretary of Agriculture
- Department of Wildlife Conservation
- Oklahoma Historical Society
- Oklahoma Insurance Department
- Association of County Commissioners of Oklahoma
- Oklahoma Municipal League
- State Fire Marshal
- Department of Labor
- A local Emergency Management Director as determined by the President of the Oklahoma Emergency Management Association
- State Chancellor or his or her representative for The Oklahoma State System of Higher Education
- State Director or his or her representative for the Oklahoma Department of Career and Technology Education
- The Team Coordinator may request participation of the heads of any other state agencies as deemed appropriate.

- The Team Coordinator shall also request that a representative of the United States Army Corps of Engineers be appointed by the administrative head of the Tulsa District to participate on the Team.
- The Team Coordinator shall also request a representative of the U.S. Department of Housing and Urban Development be appointed by the administrative head of the Oklahoma City office to participate on the team.

Oklahoma's Uniform Building Code

The State of Oklahoma adopted statewide building construction codes in 2009. As a result, the Oklahoma Uniform Building Code Commission (OUBCC), was created for the purpose of reviewing and adopting minimum building codes for residential and commercial construction to be used by all entities within the state. These codes ensure that all construction in the state is safe for citizens and visitors to the State of Oklahoma.

The OUBCC consists of technical committees, comprised of individuals in the respective trades, to review the codes and make recommendations to the Commission. The OUBCC has adopted nationally recognized base-model codes with modifications through the state's rulemaking process. All jurisdictions in the state of Oklahoma have the ability to adopt these minimum codes for their area. These jurisdictions may also adopt codes that are more restrictive.

The OUBCC's Storm Shelter Technical Committee (SSTC) has been meeting to review the requirements in the OUBCC rules for both the 2015 Editions of the International Building Code and International Residential Code. The committee is expected to make recommended changes to the adopted requirements of the IBC and IRC.

The Oklahoma Floodplain Management Act

This act, Title 82, O. S. 2001, §1601-1618, was passed by the State Legislature in 1980 and revised several times. In approving the Act, the Legislature recognized the need for a united effort between local and state government to combat recurrent flood damages. The Act establishes a state and local partnership to reduce flood damages through sound floodplain management. It authorizes communities (i.e., cities, towns and counties) to develop floodplain regulations, designate flood hazard areas, and establish floodplain boards. An amendment in 2004 called for community floodplain administrators to become accredited through the Oklahoma Water Resource Board (OWRB), ensuring that officials are properly trained to effectively administer local floodplain regulations.

Consistent with protecting the natural functions of the floodplain and reducing flood losses, the OWRB values the No Adverse Impact (NAI) floodplain management approach. NAI strategies promote responsible floodplain development through community-based decision making.

The Oklahoma Floodplain Managers Association, a state organization of floodplain officials supported by the OWRB, provides excellent training and networking opportunities that ultimately help communities better manage their floodplain areas.

5.2 Existing State Mitigation Policies and Programs to Mitigate Hazards Element (S12)

State and local governments have programs designed to help mitigate the impacts of hazard events within their jurisdictions. The following matrix indicates the program capabilities of the State and local governments that play a role in preventing and reducing the impacts of hazards.

Existing State and Local Plans and Programs

Program	Description	Applicability	Effectiveness
Emergency Operation Plan (EOP)	State Statute (OS 63 § 683.2) requires the State to maintain and update a written Emergency Operations Plan (EOP) which assigns responsibilities and actions to be taken any time the State Emergency Operations Center (EOC) is activated. State Statute (OS 63 § 683.11) requires all incorporated jurisdictions to *also* have an EOP, or else enter into agreement with their county government to manage their emergencies.	Based on *the National Incident Management System* (NIMS), the State EOP clearly defines the roles of state departments, agencies, commissions, and volunteer organizations. Communities and counties are free to adapt the State EOC as a framework for local EOCs.	The State EOP has proven highly effective any time the EOC has been activated, including 36 Federally declared disasters, 7 state emergency declarations, and 39 FMAGS. All EOPs are reviewed and revised annually. Community and county EOPs are based on ***local*** risk analyses.
State Hazard Mitigation Plan	DMA 2000 (Public Law 106- 200) encourages and rewards local and State pre-disaster planning and is intended to integrate State and local planning and implementation efforts.	Developing and maintaining a Hazard Mitigation Plan enables the State, and local jurisdictions to articulate specific mitigation needs, resulting in faster allocation of funding for effective risk reduction.	As of June 2013, Oklahoma has 123 FEMA-approved local plans covering a total of 460 jurisdictions. Compared to the May 2010 total of 185 plans for 468 jurisdictions, the number is lower due to some single jurisdictions being absorbed into multi-jurisdiction plans.
Continuity of Operations Plans (COOP	State agencies and local governments should develop an emergency	Due to Oklahoma's risks for extreme weather, it is vital that	State agency COOPS are routinely updated to

	operating plan to be followed in the event of emergency situations, to ensure continued operation of the department or agency.	each state agency have a written plan to assure seamless delivery of services to the public.	reflect changes in technology that serve to increase agency capabilities.
Capital Improvements Plans (CIP)	CIPs identify where major public expenditures will be made over the next 5 to 10 years.	CIPs can secure hazard- prone areas for low-risk uses; identify roads or utilities that need strengthening, replacement, or realignment; and prescribe standards for the design and construction of new facilities.	CIPs allow more efficient use of public funds. During this update, there is increased interest statewide to include community tornado shelters and safe rooms in local CIPs.
StormReady Communities Program	This voluntary program, developed by the National Weather Service's Tulsa forecast office, provides clear-cut advice to communities regarding weather warnings.	In order to achieve *StormReady* status, a community must establish a 24-hour warning point and EOC; have more than one way to receive weather forecasts and warnings and to alert the public; create a system that monitors local weather conditions; promote the importance of public readiness; develop a formal hazardous weather plan to include the training of weather spotters and holding emergency exercises.	As of December 2009, Oklahoma had 24 counties, 44 communities, 2 universities and 1 military base, designated StormReady. As of this update, there are 29 counties, 54 communities, 9 universities and 2 military bases in Oklahoma designated *StormReady*.
Firewise Communities Program	The Oklahoma Department of Agriculture, Food and Forestry, in cooperation with the USDA Forestry Service, provides cost share funds to communities	To be eligible for fire grants, applicants must first be *Firewise Community USA Certified*. The focus of the funding is to support new initiatives	Currently, there are 50 certified *Firewise Communities* in Oklahoma. Development of Firewise plans results in the

	for the purpose of reducing wildfire risks.	that would not occur without grant funds.	implementation of cost- effective fire mitigation initiatives designed to increase human safety, reduce structure wildfire vulnerability, and maximize firefighter agency capabilities.
Local Hazardous Materials Response Program (LEPC)	The *Oklahoma Emergency Response Act* (27A OS §4-2-102) requires that each community have a local emergency planning committee for the purpose of developing plans to address hazardous material spills	Oklahoma is the crossroads of the nation's interstate transport industry. Every day, shipments of agricultural products, manufactured goods and bulk industrial materials share the roadways. Accidental release of hazmat cargo can have life- threatening results if not remediated properly. Local emergency planning committees comprised of volunteers such as emergency responders and industry representatives provide guidance for hazmat emergency planning and response to meet the requirements of these unfunded mandates.	All events involving accidental release of chemicals are called in to the National Response Center (NRC) where data is compiled and results can be queried on-line. Additionally, the OK Department of Environmental Quality licenses all companies that perform clean-up of hazardous materials spills on State highways; and the OK Corporation Commission is alerted when incidents involve pipelines.
Community Shelters and Safe Room Programs	Other than SoonerSafe, no State-sponsored programs exist, but this initiative is gaining national attention through private fund-raising efforts, celebrity-sponsored	Currently, the State has no authority to require accountability of funds raised through these programs.	Unknown.

	events, and social media.		
SoonerSafe Residential Safe Room Program	This State-administered program utilizes FEMA funds to rebate homeowners for installation of safe rooms built to FEMA-approved designs.	Homeowners may qualify for up to 75% of their installation costs not to exceed $2000 per safe room.	This program, initiated in 1999, has been renewed as federal funding becomes available. Following the May 2013 tornados, the program received over 44,000 applications, and funded over 22,000 individual safe rooms.
Emergency Management Accreditation Program (EMAP)	EMAP, an independent, non- profit organization, offers a standard-based assessment and peer review accreditation process for government programs responsible for coordinating all aspects of disaster management, including hazard mitigation.	EMAP is currently the *only* accreditation process for emergency management programs.	Oklahoma Emergency Management was approved for EMAP certification in 2018. *Hazard Mitigation* is one of the 64 standards that were evaluated as part of the accreditation process.
Public Assistance 406 Mitigation Program	This State-administered program utilizes FEMA Public Assistance (PA) funds to fund mitigation measures in conjunction with the repair of the disaster-damaged facilities, so is limited to declared counties and eligible damaged facilities.	Limited to declared counties and eligible damaged facilities through the FEMA Public Assistance program.	240 PA Mitigation projects have been funded since 2015, with over $10.8 Million in funds award.

National Flood Insurance Program (NFIP)

The NFIP is a federal initiative that provides communities with a mechanism for implementing sound floodplain management techniques. This effective quid pro quo approach to floodplain management makes affordable flood insurance available for citizens in participating communities that enact and adhere to sound regulations that guide development in floodplains. In return, the NFIP requires the community to adopt a floodplain management ordinance containing certain minimum requirements intended to reduce future flood losses. The OWRB promotes community enrollment in the NFIP and advises the participating jurisdictions on steps to ensure future participation. The Water Board's aggressive and proactive efforts to mitigate the impacts of flooding in Oklahoma have been consistently recognized by FEMA and other organizations as the best in this region and one of the top programs in the country. Current participants in the NFIP include 5 tribes, 56 counties, and 342 cities/towns. To date, Oklahomans have received nearly $200 million in NFIP payments.

(Source: OWRB and State NFIP Coordinator)

The Community Rating System (CRS)

The CRS is an element of the NFIP. This program is designed to promote the availability of flood insurance; reduce future flood damages; and insure the accurate rating of flood insurance policies. Participating communities may receive credit for proven mitigation measures, thus reducing the cost of flood insurance within their communities. Oklahoma will continue to encourage participation in CRS.

As of October 2017, of the participating NFIP communities, 13 (or 3%) participate in the Community Rating System (CRS). Of the top 50 Oklahoma communities (in terms of flood insurance policies-in-force), 12 participate in the CRS. The remaining communities present an outreach opportunity for encouraging participation in the CRS.

COMMUNITY RATING SYSTEM
ELIGIBLE COMMUNITIES EFFECTIVE OCTOBER 1, 2017

Community Number	Name	CRS Entry Date	Current Effective Date	Current Class	% Discount for SFH	% Discount for Non-SFH	Status
400220	Bartlesville	10/1/92	10/1/02	7	15	5	C
400207	Bixby	10/1/93	10/1/98	10	0	0	R
400078	Blackwell	10/1/91	10/1/14	10	0	0	R
400236	Broken Arrow	10/1/93	10/1/17	8	10	5	C
400234	Chickasha	10/1/92	10/1/14	10	0	0	R
400233	Del City	5/1/17	5/1/17	6	20	10	C
400221	Dewey	10/1/92	10/1/92	9	5	5	C
400252	Edmond	10/1/93	10/1/08	7	15	5	C
400062	Enid	10/1/93	5/1/16	9	5	5	C
400049	Lawton	10/1/91	5/1/09	6	20	10	C
400245	Lindsay	10/1/92	10/1/93	10	0	0	R
400046	Norman	10/1/11	5/1/17	6	20	10	C
405378	Oklahoma City	5/1/14	5/1/14	8	10	5	C
400080	Ponca City	5/1/10	5/1/14	5	25	10	C
400211	Sand Springs	10/1/91	10/1/06	6	20	10	C
400053	Sapulpa	10/1/92	10/1/93	10	0	0	R
405380	Stillwater	10/1/91	5/1/17	7	15	5	C
405381	Tulsa	10/1/91	10/1/03	2	40	10	C

C = Current, R = Rescinded

(Source: https://www.fema.gov/media-library-data/1503240360683-30b35cc754f462fe2c15d857519a71ec/20_crs_508_oct2017.pdf)

Risk Mapping, Assessment and Planning (Risk MAP)

Since 2006, 41 of Oklahoma's 77 counties received effective Flood Insurance Rate Maps (FIRMs). Garfield County was the last FIRM produced in January 2013 which concluded the Map Modernization initiative. The 41 county FIRMs produced under Map Mod covered over 95% of the State's population and over 75% of the square miles in Oklahoma.

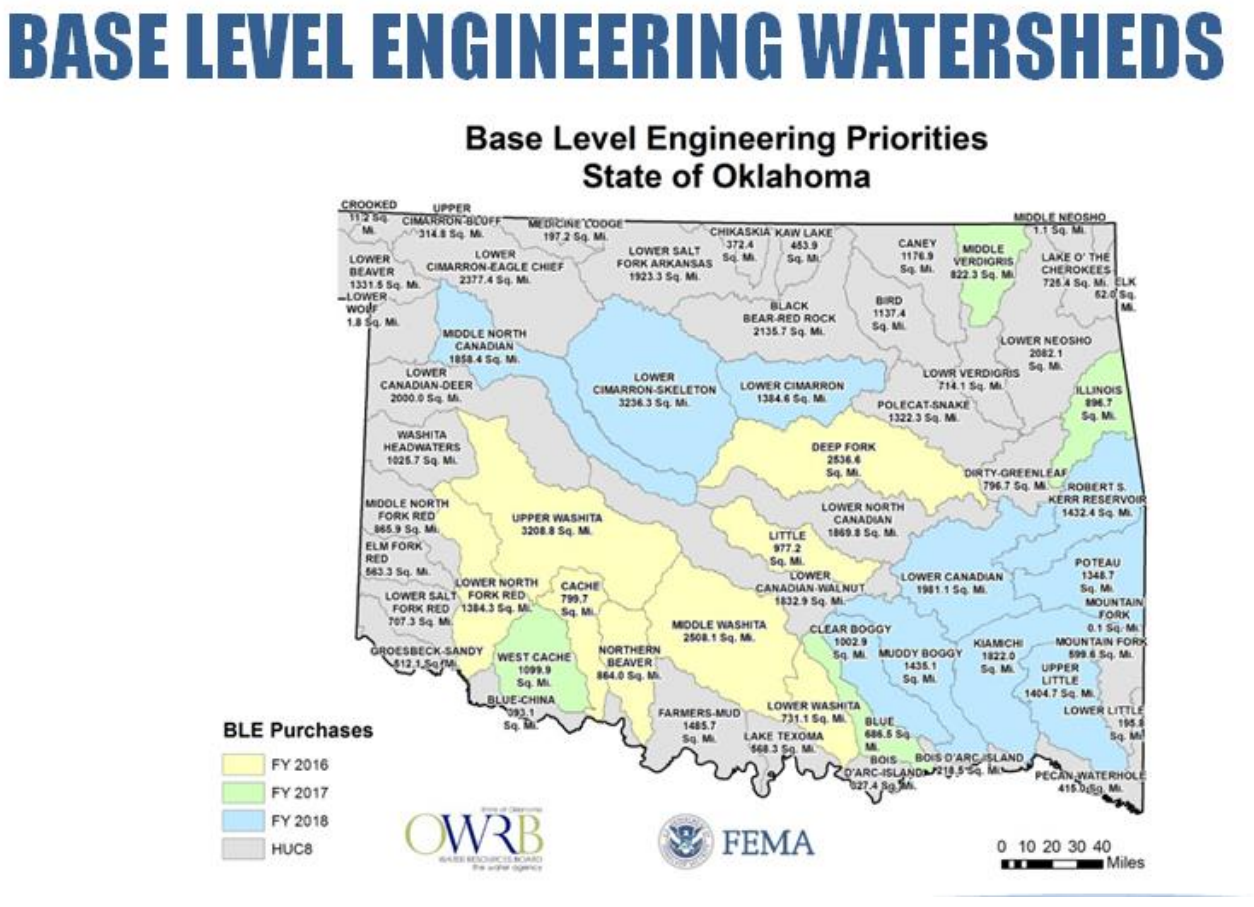
The *Map Modernization Program* has evolved to become FEMA's *Risk Map Program*. FEMA and OEM will now address risks with a *watershed* approach instead of by individual counties, as previously studied. As of May 16, 2013, Oklahoma has performed discovery on seven watersheds. Discovery is the procedure where FEMA, OEM, and OWRB solicit comments related to any risk within their community. Comments are collected and evaluated to produce a report regarding their flood risk. This report collates recommendations on what projects to undertake to reduce the watershed and jurisdiction's flood risk.

RiskMAP -Base Level Engineering

Base Level Engineering is a watershed-wide engineering modeling method that uses high resolution ground elevation, automated model building techniques, and manual model review to prepare broad and accurate flood risk information for FEMA to assess its current flood hazard inventory.

Base Level Engineering prepares flood risk information with scalable engineering models at minimal cost, allowing FEMA to assess and update its current flood hazard inventory more efficiently while increasing our operational transparency. Each mile of stream shown on a Flood Insurance Rate Map (FIRM) is required to be validated each five years. The flood hazard information is reviewed to determine if the built environment or expected flood flows have changed since the previous study was performed. A large portion of the regional flood hazard inventory of stream miles is currently unknown or unverified.

Base Level Engineering provides modeling and floodplain extents to assess these unknown and unverified mileage. Additionally, Base Level Engineering results have been prepared to meet all technical, engineering and mapping standards so that it may be used to update FIRMs in the case that the current inventory is not able to be validated.



5.3 Existing State Pre and Post HM Capabilities and Funding Sources to Mitigate Hazards Element (S12)

For this 2019 update, the Hazard Mitigation staff inventoried existing programs to identify changes that affect the State's mitigation capabilities, including:

- Changes in State funding capabilities;
- Changes in agency staffing;
- Changes in State Statutes;
- Changes in any agency policies, regulations or land use provisions;
- Changes in other State agency capabilities;
- Emergent technology tools from outside sources;
- Any obstacles that might impede hazard mitigation processes.

But technological advancements have provided increased capability, most notably in the areas of weather detection and incident preparedness. Since this Plan's last update, Oklahoma Mesonet has exponentially increased its data collection capability. Mesonet data is used by emergency management officials to develop evacuation routes; by agricultural professionals to mitigate the effects of drought and stress to livestock; and by the insurance industry to pinpoint areas at greatest risk for property loss to natural hazard events.

As an agency, OEM's communications capabilities have grown. In the past three years, OEM has documented a substantial increase in the number of registered **WebEOC** users statewide thus increasing both response and mitigation capabilities of local jurisdictions. Recently, OEM entered the social media arena with its establishment of Facebook and Twitter accounts.

Within the update period, the Oklahoma Water Resources Board (OWRB) began upgrading the State's database of dams and inundation zones using LIDAR sensing and digital mapping techniques. This effort will provide immediate, no-cost Internet access to dam records for planning and mitigation professionals.

5.3.1 Coordinating Agencies and Funding Sources

Agency	Coordination/Services	Available Funding	Supports Mitigation Actions
National Weather Service	1) Hydro-Meteorological Studies 2) Weather Surveillance 3) NOAA Weather Radio 4) National Warning System 5) River Forecast Center		1) Yes 2) Yes 3) Yes 4) Yes 5) Yes
US Dept. of Agriculture	1) Extension Services 2) Farm Service Agency 3) Rural Electrification Admin 4) Natural Resource Cons Service 5) Watershed Protection/Flood Prevention (PL 83-566) 6) Flood Control Act 1944, (PL 78-534) 7) Floodplain Mgmt. Studies 8) RC&D Program (PL 88-703) 9) Emergency Watershed Protection 10) Conservation Tech Assistance	1) Farm Service Agency loans 2) Emergency Loans 3) REA loans/tech asst. 4) NRCS Financial/Tech assistance 5) Financial/Tech assistance 8) Financial/Tech assistance	1) Yes 2) Yes 3) Yes 4) Yes 5) Yes 6) Yes 8) No 7) Yes 8) Yes 9) Yes 10) Yes

		9) Agricultural Credit Act of 1978	
US Army Corps of Engineers, Tulsa District	1) Feasibility Studies/Projects 2) Emergency Stream Bank Protection 3) Small Flood Control Projects 4) Flood Control/Snagging & Clearing 5) Emergency Operations (PL 84-99) 6) Floodplain Management Services 7) Permit Authority 8) Disaster Response 9) Flood Control 10) Dam Safety	8) Memorandum of Understanding	1) Yes 2) Yes 3) Yes 4) Yes 5) Yes 6) Yes 7) Yes 8) No 9) Yes 10) Yes
Bureau of Reclamation, US Department of the Interior	1) Water Supply 2) Flood Control 3) Recreation 4) Fish & Wildlife 5) Feasibility Studies/Projects 6) Dam Safety		1) No 2) Yes 3) No 4) No 5) Yes 6) Yes
Fish & Wildlife Service, US Department of the Interior	1) Flood Hazard Mitigation		1) Yes
US Geological Survey, US Department of the Interior	1) Data Collection 2) Monitoring 3) Analysis 4) Predictive Modeling		1) Yes 2) Yes 3) Yes 4) Yes
National Park Service, US Department of the Interior	1) Flood Hazard Mitigation (Chickasaw National Recreation Area) 2) Construction 3) Shoreline Processes		1) Yes 2) Yes 3) Yes
US Department of Housing and Urban Development	1) Community Planning and Development 2) Home Investment Partnership Act 3) FHA Single Family Programs 4) Multi-family Housing Programs 5) Public Housing 6) Native American Programs	1) Grant program (match HMGP/PDM) 2) Home program 3) Mortgage/loan insurance 4) Mortgage Insurance program 5) Funding & assistance 6) Indian Home Loan Guarantee Program and Indian Community Development Block Grant Program	1) Yes 2) Yes 3) Yes 4) Yes 5) Yes 6) Yes
US Department of Transportation	1) Post Flood Disaster replacement and/or reconstruction of highway facilities		1) Yes
US Small Business Administration	1) Financial Assistance-Disaster Loan Program	1) Home disaster loans, Business physical disaster loans, Economic injury disaster loans	1) No
American Red Cross	1) Emergency & Health Services 2) Disaster Relief Programs		1) No 2) Yes
Oklahoma Department of Agriculture-Forestry Division	1) Rural Fire Defense Program 2) Fire Weather Alerts/Red Flag Warnings 3) Technical Advice 4) Forest Stewardship Program 5) Forest Heritage Center		1) Yes 2) Yes 3) No 4) Yes 5) No 6) Yes

	6) Project Learning Tree Program 7) Urban & Community Forestry Program 8) Water Quality Management Program 9) Regeneration/ Improvement Center		7) Yes 8) No 9) Yes
Oklahoma Climatological Survey	1) Oklahoma Mesonet 2) Flash Flood Guidance 3) Drought Monitoring Website 4) Historical Information		1) Yes 2) Yes 3) Yes 4) Yes
Oklahoma Department of Commerce	1) Community Development Programs	1) Grant & Loan Programs	1) Yes
Oklahoma Conservation Commission	1) District Operation Division 2) Water Quality Division 3) Mine Land Reclamation Division	1) Small Watershed Flood Control Fund 2) Cost Share Program/Watersheds 3) Federally Funded	1) Yes 2) Yes 3) Yes
Oklahoma Emergency Management Association	1) Storm Spotters Network 2) Emergency Operations Center 3) Disaster Preparedness Network		1) Yes 2) Yes 3) Yes
Oklahoma Department of Management and Enterprise Services	1) State Self Insurance Program 2) Capital Assets Management 3) Central Purchasing 4) Human Capital Management 5) Information Services		1) Yes 2) No 3) No 4) No 5) No
Oklahoma Department of Emergency Management	1) Preparedness, Response, Recovery, Mitigation Programs; Mitigation of repetitive loss property; Mitigation of Severe repetitive loss properties.	1) Federal Financial Assistance Programs; HMGP, FMA, SRL, PDM	1) Yes
Oklahoma Department of Environmental Quality	1) External Affairs Division 2) State Environmental Laboratory 3) Air Quality Division 4) Land Protection Division 5) Water Quality Division 6) Environ. Complaints & Local Services	4) Hazard Material Emergency Planning 5) Loans/Principal Forgiveness Projects	1) Yes 2) Yes 3) Yes 4) Yes 5) Yes 6) Yes
Oklahoma Floodplain Managers Association	1) Floodplain Management 2) Member Services 3) Internal Development/OFMA Strategic Plan	2) Training/Education	1) Yes 2) Yes 3) Yes
Oklahoma Geological Survey	1) Earth Science Education 2) Geological Mapping 3) Earthquake Information Center		1) Yes 2) Yes 3) Yes
Oklahoma Department of Human Services	1) Temporary Emergency Assistance 2) Human Resource Management Division	1) Individual/Family Grants	1) Yes 2) No
Oklahoma Water Resources Board	1) National Flood Insurance Program 2) Dam Safety Program 3) Administration of State Water Laws 4) Water Resource Planning 5) Floodplain Management Program 6) Drought/Weather Mitigation	1) Community Assistance Program 2) Training/technical assistance 4) Loan/Grant Programs 5) Flood Insurance	1) Yes 2) Yes 3) No 4) Yes 5) Yes 6) Yes

5.3.2 The National Weather Service (NWS)

The mission of the NWS is to provide weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy. By increasing

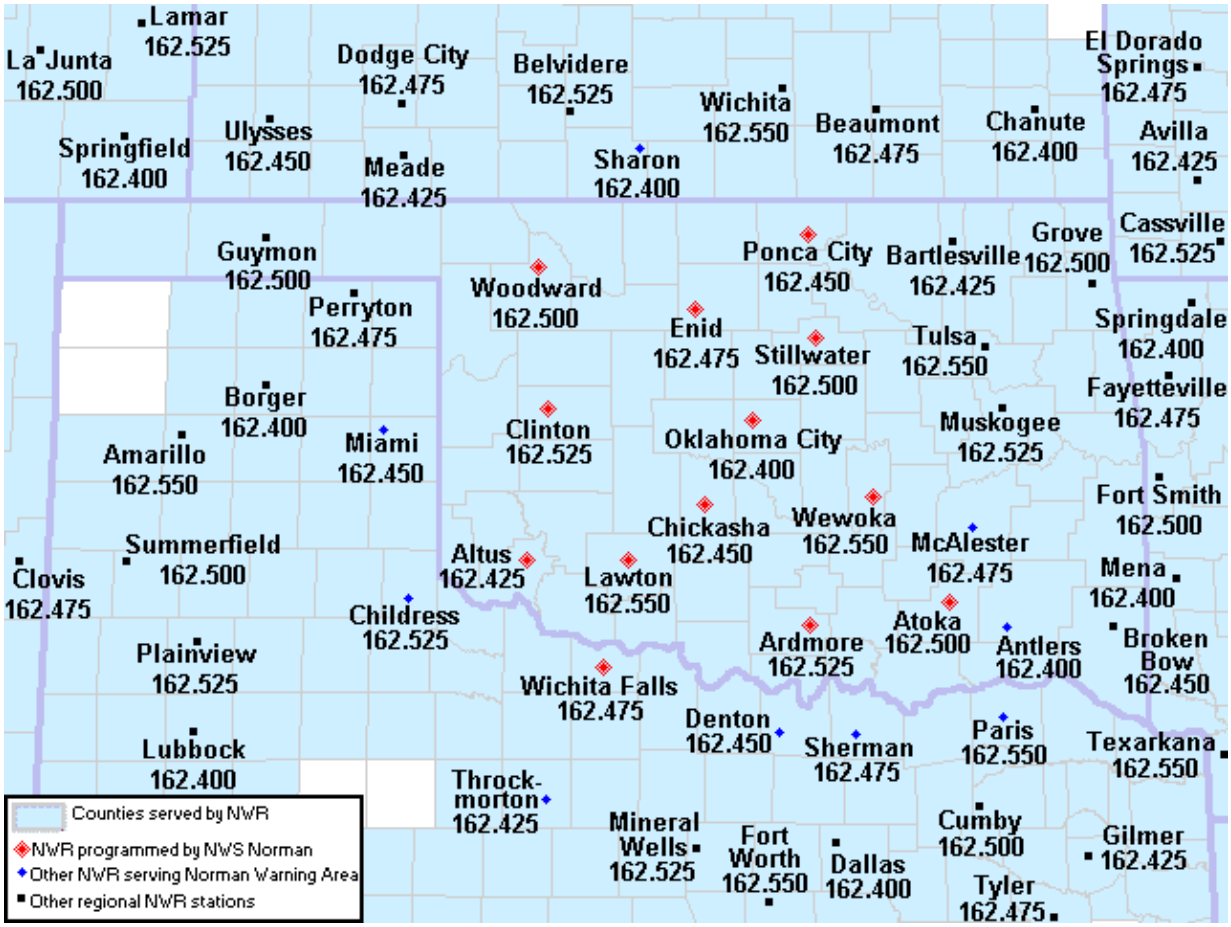
the nation's weather-readiness, the country will be better prepared to protect, mitigate, respond to, and recover from weather-related disasters. The NWS supports its mission through the following programs:

- The **Advanced Hydrologic Prediction Service (AHPS)** is a suite of river forecast products offered by the NWS. These Internet-based products enable both government agencies and the general public to make better informed decisions regarding flood and drought mitigation. AHPS began as a post-disaster pilot program in the 1990's to monitor river levels in the Midwest and quickly grew into a nationwide program.

  AHPS utilizes data from a network of river water level gauges around the country, plus computer models, satellite data, and Doppler radars, to develop customized products that more accurately predict floods and droughts. These advanced forecasting products are the basis for the operation and management of flood-control structures. Emergency management officials can then use this data to develop evacuations plans and develop measures to mitigate the impact of flooding. The same data can also provide information about potential droughts. The information provided by the AHPS is invaluable to power companies, developers, businesses, as well as recreational users.

- The **River Forecast Center (RFC)** located in Tulsa, OK, was founded as the Tulsa River Forecast Center in December 1947 in response to the record floods of 1945 in the Arkansas and Red River basins. Its mission has remained essentially unchanged through the years, while its geographical reach has extended all the way downstream to the Mississippi River, incorporating over 208,000 square miles and portions of seven states. The Tulsa RFC was selected as the first prototype site for modernized RFC technologies and operations. In 1991, the center was renamed **the Arkansas-Red Basin RFC** to better convey the area of responsibility. The data used by the RFC is provided by the US Army Corps of Engineers and USGS from water gauges on the rivers and streams from 200 river forecast points, 100 of which are located in Oklahoma, and combined with NWS satellite and radar data, then input to the hydrologic computer program model to develop the River Stage forecast.
- **Weather Surveillance RADAR-NEXRAD (WSR-88D) -** The National Weather Service operate WSR-88D RADAR systems to detect and warn for severe thunderstorms, flash floods and tornadoes across Oklahoma. This system can predict rainfall patterns with more lead time when severe weather is occurring or anticipated. This state-of-the-art, computer-based, S-band (10 cm), Doppler weather radar system covers all areas of the United States including Alaska and Hawaii, as well as parts of the Caribbean. Currently there are 14 Radars that monitor Oklahoma.

NWS NOAA Weather Radio Coverage of Oklahoma



Source: National Weather Service website

NOAA Weather Radio Network (NWR) – Oklahoma is served by 13 transmitters programmed by the National Weather Service's Norman offices, as well as 10 additional transmitters programmed by other NWS locations, ensuring 100% coverage for the state of Oklahoma.

5.3.3 U.S. Department of Agriculture

Post-disaster assistance may be provided to Oklahomans including farmers, ranchers, and agricultural producers by the USDA in the form of grants, technical assistance, and educational programs through the following programs:

Oklahoma Cooperative Extension Service (OCES)

Educational materials are provided through state universities to farmers, ranchers and others on what they can do to protect themselves and their property against hazards associated with disasters. This may also include technical advice on cleanup of damaged property; sanitation precautions; insect control; food preparation in an emergency; recovery actions on damaged farms; and renovation of damaged equipment and property.

Emergency Farm Loans

If the county is declared by the President or Secretary of Agriculture to be a disaster area, low-interest loans may be available through the *Farm Service Agency* to repair or replace buildings or other structures; purchase livestock and equipment; pay essential living expenses.

The Rural Utility Service (RUS)

This agency may provide electric and telephone cooperatives with low-interest loans and technical assistance to repair infrastructure and implement mitigation measures following a natural disaster.

The Natural Resource Conservation Service (NRCS)

This agency provides technical and financial assistance for soil erosion prevention on any watershed impaired by any natural disaster. The NRCS administers the Resource Conservation and Development Program (RC&D) authorized under Public Law 88-703. Under this program, technical and financial assistance is available for installation of flood prevention measures; however, funding for this program is limited.

5.3.4 U.S. Army Corps of Engineers, Tulsa District

Member Oklahoma Hazard Mitigation Team

The United States Army Corps of Engineers (USACE) has authority under Public Law 84-99 to assist public agencies in responding to flood emergencies. Assistance can be in the form of technical assistance, direct assistance, or rehabilitation of federal and certain non-federal flood control works, damaged or destroyed by floods. The USACE develops and implements flood control plans, and also has authority for emergency operations, stream bank protection, permit administration, and technical assistance. In Oklahoma, activities of the USACE include:

Feasibility Studies and Projects - Congress can authorize the USACE to perform feasibility studies that may result in projects for flood control, navigation, hydropower, water supply, and recreation.

Continuing Authorities – The USACE has discretionary authority to implement certain types of water resource projects without specific Congressional authority. These projects are typically limited in scope and cost. Currently, federal cost limitations are:

(1) Emergency Stream Bank Protection of Public Facilities: $500,000

(2) Small Flood Control Projects: $7.5 million

(3) Snagging and Clearing for Flood Control: $500,000

Emergency Operations - Under the provisions of Public Law 84-99, the USACE has the authority to respond to flood emergencies. This authority includes flood control operations, constructing advance measures (temporary) in anticipation of imminent flooding, and the repair of damaged flood control **works after the flood event.**

Floodplain Management Services - The USACE can provide assistance in evaluating flood hazards to a site, floodplain delineation, technical assistance, guidance, and comprehensive floodplain management to local and state governments, and authorized tribal organizations.

Permit Authority - By law, the USACE has the authority to issue Section 10 permits to cover construction, excavation, and other related work in or over navigable waterways; and Section 404 permits covering the discharge of dredged or fill material in all waters of the United States, to include adjacent wetlands.

Disaster Response - The USACE has a *Memorandum of Understanding* to coordinate with and support all FEMA response activities. Following the 1995 bombing of the Murrah Building, the USACE established a Disaster Field Office in Oklahoma City to coordinate public works and engineering in accordance with the Federal Response Plan. This effort included providing search and rescue personnel and structural engineering support. After the May 3, 1999, tornadoes that hit parts of Oklahoma, the USACE was involved in many aspects of the response and recovery, most notably the contracting and monitoring of debris removal from the tornado areas.

Flood Control - The USACE is responsible for controlling floodwater releases from all USACE lakes. The USACE also has agreements to monitor and control flow releases from dams owned or controlled by Grand River Dam Authority (GRDA), Bureau of Reclamation, and other federal agencies.

Dam Safety - The USACE has mandatory annual training for personnel on dam safety and all dams are inspected every four years for safety standards and the integrity of the dams.

5.3.5 U.S. Department of the Interior

The U. S. Department of the Interior is a Cabinet-level agency that manages America's vast natural and cultural resources through nine technical bureaus, six of which are active in Oklahoma's hazard mitigation initiative:

U.S. Bureau of Indian Affairs (BIA)

The BIA is responsible for managing and protecting natural resources on Indian trust lands. It provides community services, operates or provides financial support to operate schools, maintains law enforcement systems, provides social services, and assists in farming, ranching, forestry and mining on tribal reservations.

U.S. Bureau of Land Management (BLM)

The BLM is responsible for the appropriate multiple use management of natural resources. BLM also has the responsibility for mineral leasing and supervision of mineral operations on federal mineral estates that underlie other surface ownership and on Indian mineral estate lands held in trust.

U.S. Bureau of Reclamation (BOR)

Reclamation operates and maintains multi-purpose federal water projects in the 17 western states. Reclamation has constructed over 600 dams and reservoirs, including Hoover Dam, since the agency was established by the Reclamation Act of Congress in 1902. Authorized purposes at each project may include: water supply for agricultural irrigation and municipal uses, hydroelectric power, flood control, recreation, and fish and wildlife benefits. Reclamation constructed seven dams in Oklahoma including Altus Dam (Lake Altus also known as Lugert-Altus), Arbuckle Dam (Lake of the Arbuckles), Fort Cobb Dam (Fort Cobb Reservoir), Foss Dam (Foss Reservoir), McGee Creek Dam (McGee Creek Reservoir), Mountain Park Dam (Tom Steed Reservoir), and Norman Dam (Lake Thunderbird).

U.S. Fish and Wildlife Service

The Fish and Wildlife Service has a principal federal responsibility to conserve, protect, and enhance fish and wildlife and their habitats. The Service manages the national wildlife refuge system. In addition, the Service manages fish hatcheries and is responsible for flood hazard mitigation in nine wildlife refuge areas in Oklahoma.

U.S. Geological Survey (USGS)

Created by an act of Congress in 1879, the USGS is the sole science agency for the Department of the Interior. The USGS serves the Nation as an independent fact-finding agency that collects, monitors, analyzes, and provides scientific understanding about natural resource conditions, issues, and problems. The USGS has no regulatory or management mandate. The diversity of scientific issues that demand attention has prompted the USGS to focus its efforts into four major areas: natural hazards, resources, the environment, and information and data management. USGS scientific efforts include long-term data collection, monitoring, analysis, and predictive modeling.

National Park Service (NPS)

The NPS has the dual responsibility of protecting the natural and cultural resources of the park areas and providing for their use and enjoyment by the public. The NPS also conducts programs that promote and assist outdoor recreation planning, preservation of cultural and natural resources, and environmental compliance and review along with other federal agencies, state and local governments, and private organizations. The NPS is also responsible for flood hazard mitigation in Oklahoma for the Chickasaw National Recreation Area.

5.3.6 U.S. Department of Housing and Urban Development

As the name implies, the U.S. Department of Housing and Urban Development (HUD) is the agency of the federal government whose primary mission is to assist in providing good quality housing and suitable living environments for all segments of the population.

HUD has the capacity to wave or modify some policies and procedures in the event of Presidential disasters. Any discussion of replacement of disaster-damaged homes and hazard

mitigation is of interest to HUD. For purposes of this Plan, special emphasis has been placed on how these programs relate to hazard mitigation, both before and after a disaster.

CDBG Disaster Recovery Program

The U.S. Department of Housing and Urban Development (HUD) provides flexible grants to help cities, counties, and States recover from Presidentially declared disasters, especially in low-income areas, subject to availability of supplemental appropriations. In response to Presidentially declared disasters, Congress may appropriate additional funding for the Community Development Block Grant (CDBG) program as Disaster Recovery grants to rebuild the affected areas and provide crucial seed money to start the recovery process.

The Oklahoma Department of Commerce, working closely with OEM and inviting input by communities, individuals and other interested parties, have developed an action plan that outlines the eligible activities available to assist counties to address these mitigation and critical restoration needs.

Under CDBG, the Section 108 Loan Guarantee Program provides opportunities for cities and towns to use HUD programs to reduce the risk of adverse impacts on communities prior to the occurrence of disaster. It allows them to transform a portion of their CDBG funds to pursue physical and economic revitalization projects that can renew entire neighborhoods. For example, houses that are located in flood-prone areas have a heightened exposure to sustaining damage from floods. Cities and towns might use CDBG, HOME funds, and local public and/or private resources to avoid this risk by creating more suitable, good quality housing opportunities elsewhere in the city.

The federal government, primarily through FEMA and SBA, provides disaster relief to meet some emergency, short term recovery needs. However, communities may elect to use their CDBG funds for emergency, short-term assistance if such activities are not funded by FEMA or SBA. CDBG may be used to fund clearance of debris and emergency reconstruction of essential infrastructure.

The Federal Housing Administration (FHA), a division of HUD, provides mortgage insurance for single-family homes. A “safe room” is an eligible amenity that can be included in an FHA mortgage. Also, during the loan approval process, FHA is required to ensure that new construction projects comply with FEMA requirements as they relate to development in Special Flood Hazard Areas.

5.3.7 U.S. Department of Transportation

The Federal Highway Administration (FHWA) is an agency within the U.S. Department of Transportation which oversees and approves the design and construction of federal aid highways. Regulations developed by FHWA to implement *Executive Order 11988* (Floodplain Management, May 24, 1977) are contained in 23 CFR § 650A prescribes the policies and procedures for the location and hydraulic design of high encroachments on floodplains. Any post flood disaster replacement or reconstruction of severely damaged highway facilities, using federal aid funding, would support hazard mitigation initiatives.

5.3.8 U.S. Small Business Administration

The SBA was created by Congress in 1953 to provide financial assistance to victims of disasters. The SBA's Disaster Loan Program offers financial assistance to enable individuals and certain non-profit agencies to rebuild homes and businesses in the aftermath of a disaster. The SBA provides low interest loans, usually 4% or less, and/or long-term loans of up to 30 years for disaster victims. These loan proceeds may be used to repair or replace disaster-damaged property that is not fully covered by insurance.

5.3.9 American Red Cross

It is not a government agency, but its authority to provide disaster relief was formalized when, in 1905, the Red Cross was chartered by Congress to "carry on a system of national and international relief in time of peace and apply the same in mitigating the sufferings caused by pestilence, famine, fire, floods, and other great national calamities, and to devise and carry on measures for preventing the same." The American Red Cross provides a variety of essential emergency and health services through its many programs to people around the world. All services are consistent with the American Red Cross mission of helping people prevent, prepare for, and respond to emergencies and are provided by trained paid and volunteer staff members.

5.3.10 Oklahoma Department of Agriculture-Forestry Division

Member of Oklahoma Hazard Mitigation Team

The Forestry Services Division of the Oklahoma Department of Agriculture, Food and Forestry serves the public, private landowners, forest industry, cities and towns, and other agencies and organizations through a wide variety of programs. These services include protection, management, improvement and use of Oklahoma's forests and natural resources and their associated benefits. Oklahoma has an estimated 7.5 to 10 million acres of forestland. Professional foresters provide assistance in all 77 counties, contribute to the economy, and improve the quality of life of all Oklahomans.

Created by the Oklahoma Legislature in 1925, the Forestry Services Division began as an agency charged with public education, reforestation, and wildfire control to help the forests recover from overcutting and uncontrolled burning. As the public's interest in conservation grew, and federal and state programs were enacted, Forestry Services began to address natural resource issues with a comprehensive program of service in forest management, forest protection, law enforcement, education, urban forestry, water quality, forest regeneration, and tree improvement and fire department assistance.

Forestry helps maintain forest health by minimizing damage from destructive wildfires, insects and diseases and by helping improve the productivity of the state's forests.

These services are provided through the Forestry Services Division

- Rural Fire Defense Program
- Community Wildfire Preparedness Program
- Statewide Wildfire Control and Management

- Wildland firefighting training to Oklahoma's career and volunteer fire departments
- Develop and maintain criteria for Fire Weather Watches and Red Flag Warnings
- Provide wildfire mitigation information and technical advice to landowners and communities
- Forest Stewardship Program
- Utilization and Marketing advice to the forest industry
- Forestry education through the Forest Heritage Center and direct contact with schools, communities and civic groups
- Project Learning Tree programs
- Urban and Community Forestry Program
- Forest Water Quality Management Program
- Forest Regeneration and Forest Tree Improvement Centers

5.3.11 Oklahoma Climatological Survey

Member of Oklahoma Hazard Mitigation Team

The Oklahoma Climatological Survey (http://www.climate.ok.gov) was established in 1980 to provide climatological services to the citizens of Oklahoma, conduct research on the impacts of climate on human activities, and serve as a support facility for the State Climatologist. OCS has a legislative mandate to acquire, process, and disseminate climate and weather data and information for use by the state's citizens. The Survey maintains an extensive array of climatological information; operates the Oklahoma Mesonet, the nation's premier environmental monitoring network, and hosts a wide variety of educational outreach and scientific research projects. The OCS is a research unit of the College of Atmospheric and Geographic Sciences at the University of Oklahoma.

OCS historical information includes documenting tornado occurrences in the state, assessing the likelihood of severe weather, and documenting recent events that resulted in Federal disaster declarations in the state. Products on the OCS website include historical averages and extremes, available at a county or sub-county level, a weather timeline, and synthesized information for monitoring drought, heavy rainfall, and other weather hazards.

OCS also operates several outreach programs that provide training, products, and decision-support systems tailored to the needs of different groups. Groups served by OCS outreach programs include K-16 education, emergency management, wildfire manages, and agricultural producers. Additional information about these programs is on the OCS website under the Outreach tab.

A staff of climatologists at OCS is available to assist local decision-makers. OCS climatologists are adept at tailoring Oklahoma's climate records to provide information that can improve

decision-making, whether in real-time or longer term risk analysis. Data archives allow staff to provide from the 'big picture' overview of Oklahoma climate, to local historical probabilities and occurrences of significant weather events. OCS programs include the following:

The Oklahoma Mesonet

This is a statewide network of 120 automated weather stations, with at least one station located in each county in Oklahoma. The network was developed through the cooperation of Oklahoma State University and The University of Oklahoma and established in 1994. The Mesonet reports observations of temperature, rainfall, winds, humidity, pressure, solar radiation, and soil temperature and moisture at 5-minute increments, around-the-clock. Mesonet data serve as the backbone of a number of public-safety oriented products provided by OCS.

Among the products provided by OCS and the Mesonet are real-time weather information, historical event and climate summaries, and several products tailored to public safety applications. Most real-time weather data, including radar images from sites around the state, are available online at http://www.mesonet.org. The Mesonet offers several products for real-time assessment of hazardous conditions.

OK-First Program

OK-First serves Oklahoma's emergency management and public safety communities, including meeting many of the requirements for the National Weather Service's *Storm Ready* community certification. Participants attend workshops where they learn how to access and interpret radar and other weather data sources, improve coordination of storm spotter activities with state and federal officials, and interact with colleagues and mentors from the state's meteorology community. Refresher workshops are offered every 18 months to provide the latest technology and weather information. OK-FIRST was recognized with Harvard *University's Innovations in American Government* award in 2001.

Southern Climate Impacts Planning Program (SCIPP)

The Southern Climate Impacts Planning Program (http://www.southernclimate.org) is a climate hazards preparedness program focused on the South Central United States, which aims to bridge the gap between climate science and local and state hazard planning processes. Focusing on the six-state region of Oklahoma, Texas, Louisiana, Arkansas, Tennessee, and Mississippi, SCIPP investigates major climate hazards of the region and actively engages community-level decision makers to determine hazard planning and climate data gaps; collaboratively develop assessment and decision support tools; and provide education and outreach.

Major climate hazards of interest of SCIPP include droughts, floods, hurricanes, and severe storms. As one of the National Oceanic and Atmospheric Administration's Regional Integrated Science and Assessment (RISA) Teams, SCIPP strives to continue the success of the RISA program in conducting critical, interdisciplinary research through

stakeholder partnerships. SCIPP is a collaborative research effort between the Oklahoma Climatological Survey at the University of Oklahoma and the Department of Anthropology and Geography/Southern Regional Climate Center at Louisiana State University.

5.3.12 Oklahoma Department of Commerce

Member of Oklahoma Hazard Mitigation Team

The Oklahoma Department of Commerce is the primary economic development arm of the State of Oklahoma. The Department's goals are to stimulate the creation, expansion, and retention of jobs and growth of investment in all parts of Oklahoma.

The Department's Community Development Programs provide grants and loans in cases of hazard mitigation as they relate to wastewater treatment facilities, drainage, and other infrastructure needs, primarily in rural areas.

Due to the amount of grants and loans the Department administers, the Department maintains its legacy system to ensure proper distribution and accounting of those grants and loan funds.

5.3.13 Oklahoma Conservation Commission

Member of Oklahoma Hazard Mitigation Team

The Oklahoma Conservation Commission's (OCC) mission is to conserve, protect and restore Oklahoma's natural resources, working in collaboration with the conservation districts and other partners, on behalf of the citizens of Oklahoma. OCC provides assistance to Oklahoma's 84 conservation districts and the public to foster a sense of stewardship and conservation management of Oklahoma's renewable natural resources. This is accomplished through soil and water conservation, land use planning, small watershed upstream flood control, abandoned mine land reclamation, water quality monitoring, environmental education and wetlands conservation. OCC's divisions and area of responsibilities include:

Administration Division represents the Commission board in providing oversight and support for all Conservation Commission operations and programs, as well as management of public communication activities and production of public information materials. This division makes policy decisions for the agency.

Abandoned Mine Land (AML) Reclamation Division task is to protect the public from hazards left as a result of past coal mining practices. The primary objective of the AML division is to reclaim surface and underground coal mine sites abandoned prior to August 3, 1977, and that pose the highest threat to the public's health, safety, and general welfare. This program is 100 percent federally funded from tax on active coal mine production. The AML Program is coordinated with 16 local conservation districts with particular emphasis placed on the public's involvement in identifying hazardous AML sites.

Conservation Programs Division provides management and technical assistance to Oklahoma's 84 conservation districts in two major program areas:

Small Watershed Program - Upstream Flood Control

The division assists conservation districts in the new construction of upstream flood control dams, the operation and maintenance of existing dams and with the rehabilitation of aging dams. Operation and maintenance of 2,107 flood control dams is a major job for conservation districts serving as local sponsors for most of the projects. The Conservation Programs Division provides equipment, financial assistance and technicians to help conservation districts carry out this responsibility.

Locally-Led Conservation Cost-Share Program

The division administers the Oklahoma Cost-Share Program. This program, authorized by the Oklahoma Legislature in 1998, provides funds to conservation districts to help landowners install conservation practices on the land to reduce soil erosion and improve water quality.

Water Quality Division is responsible for identifying waters impaired by nonpoint source pollution, which is pollution that comes from multiple sources, such as pesticides, fertilizers, sediment, and animal waste. Once problems are identified, we work to prioritize and implement projects to reduce the pollutants and improve water quality.

Office of Geographic Information and Technical Services Division is responsible for housing the State Office of Geographic Information and the State GIS Coordinator as well as maintaining Oklahoma Conservation Commission's geographic information systems (GIS) operations and database. The division also coordinates computer network support for the agency and for conservation districts.

5.3.14 Oklahoma Corporation Commission

Member of Oklahoma Hazard Mitigation Team

The Oklahoma Corporation Commission (OCC) was established in 1907 by the Oklahoma Constitution. The OCC has regulatory authority over aspects of oil and natural gas exploration and production activities, including seismic activity linked to oil and gas activity, trucking, fueling facilities, electric and natural gas utilities, railroads, interstate pipelines, towing companies, telephone companies, passenger carriers, and transportation network providers (e.g., Uber, Lyft).

The OCC supports the State’s hazard mitigation by and enforcing all state and federal regulations and developing rules regarding oil and gas exploration and production, transportation, storage, and disposal of crude, natural gas, refined petroleum products and oil and gas waste. The Commission has judicial, legislative, and administrative authority to carry out its mission.

5.3.15 Oklahoma Emergency Management Association

Member of Oklahoma Hazard Mitigation Team

OEMA is a non-profit association whose goal is to assist local, state, tribal and federal agencies in the establishment and maintenance of effective emergency management organizations. Through research, legislative review, information exchange and education programs, OEMA strives to advance the professional standards of persons engaged in these activities.

Local emergency managers coordinate and direct the planning, organization, control, and implementation of local emergency management activities. Such activities may include the development of a severe storm spotter network designed to provide advanced/early warning of impending severe weather threats to the community. Oklahoma local emergency managers manage, operate and maintain Emergency Operations Centers, and coordinate, develop and implement the Emergency Operations Plan (EOP) for their jurisdiction and update it annually. They coordinate with community officials and with Oklahoma Emergency Management (OEM) as necessary to ensure the effective administration of the emergency management program. They prepare and distribute disaster preparedness material to the citizens of their jurisdiction, with the intent of offering an appropriate means of educating the community as to how they may prepare for and protect themselves from the consequences of potentially dangerous disasters.

5.3.16 Oklahoma Department of Management and Enterprise Services

Member/Chairperson of Oklahoma Hazard Mitigation Team

The Oklahoma Department of Emergency Management (OEM) prepares for, responds to, recovers from and mitigates against disasters and emergencies. OEM was created as the Department of Civil Defense by legislative action in 1951. Soon after its creation, the Civil Defense agency and the Department of Emergency Resources Management were combined into one unified disaster aid organization. Today, the department serves as the state's liaison with federal and local agencies on emergencies of all kinds. OEM maintains the State Emergency Operations Center which serves as a command center for reporting emergencies and coordinating state response activities. OEM delivers service to Oklahoma cities, towns and counties through a network of more than 400 local emergency managers. OEM also maintains, regularly updates and exercises the State Emergency Operations Plan.

The Department also procures and administers other funds for emergency management research and construction projects. OEM provides professional assistance, and maintains liaison with all state agencies, various federal agencies, local governments, industry, and the general public in the event of a natural, technological or man-made disaster.

As the Grantee for FEMA, OEM partners with FEMA to receive guidance and assistance in managing federal disasters, adhering to all regulations contained in the Stafford Act, as well as FEMA policies and guidelines. The OEM director is the *Governor's Authorized Representative* empowered by the Governor of Oklahoma to execute all necessary documents for disaster assistance.

5.3.17 Oklahoma Department of Emergency Management

Member/Chairperson of Oklahoma Hazard Mitigation Team

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5.3.18 Oklahoma Department of Environmental Quality

Member of Oklahoma Hazard Mitigation Team

The Oklahoma Environmental Quality Act (OEQA), passed in 1992, provides for the administration of environmental functions to provide that environmental regulatory concerns of industry and the public are addressed in an expedient manner; improve the manner in which citizen complaints are tracked and resolved; better utilize state financial resources for environmental regulatory services; and, coordinate environmental activities of state environmental agencies. In addition to its administration component and the Support Services Division, DEQ has a strong compliance/enforcement program.

The OEQA provides that each state environmental agency shall be responsible for:

- fully implementing and enforcing the laws and rules within its jurisdictional areas of environmental responsibility
- utilizing and enforcing the Oklahoma Water Quality standards
- seeking to enforce and strengthen relationships between federal, state, regional, and local environmental planning, development and management programs
- cooperate with all state environmental agencies and other entities to protect, foster and promote the general welfare and the environment and natural resources of the state

The Oklahoma Department of Environmental Quality (DEQ) was created to meet those legislative requirements within its jurisdictional area of environmental responsibility. As outlined, DEQ has jurisdictional responsibility for the following:

- Point Source and non-Point-Source discharges of pollutants
- Storm water discharge from all facilities, except those where specific authority has been designated to either the Department of Agriculture or the Oklahoma Corporation Commission;
- Surface and groundwater water quality standards;
- Sole environmental jurisdiction to regulate air emissions from all facilities and sources subject to requirements of Title V of the Federal Clean Air Act;
- Superfund responsibilities of the state under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) and amendments thereto;
- Radioactive waste and all regulatory activities for the use of atomic energy, except for diagnostic x ray facilities; public and private water, and wastewater supply or treatment systems;
- Solid waste and hazardous substances; environmental regulation of any entity or activity;
- Prevention, control and abatement of any pollution, not subject to the specific statutory authority of another state environmental agency.

5.3.19 Oklahoma Floodplain Managers Association

The Oklahoma Floodplain Management Association was officially organized in November 1990 with the intent of bringing together those individuals who have a common interest in floodplain management. In the first year of its existence, membership more than tripled. In September 1999 the name was changed to Oklahoma Floodplain Managers Association. The OFMA objectives are to:

- Promote interest in flood damage abatement
- Improve cooperation among various related local, state and federal agencies
- Encourage innovative approaches to managing the nation's floodplain

OFMA issues a quarterly newsletter to broaden public awareness of Oklahoma's flood hazards. They also provide training to elected officials, floodplain managers, surveyors, engineers, lenders, and real estate agents and promote a Certified Floodplain Manager (CFM) program. OFMA holds an annual conference with guest speakers who discuss pertinent floodplain management issues. Interacting with other members provides opportunities for exchanging ideas and networking among agencies and companies to build cooperation. The association brings together those individuals who are experiencing similar problems with those who may have solutions. OFMA is a non-profit organization and has the ability to communicate a uniform position on current concerns, rule changes, local programs and other issues impacting floodplain management.

5.3.20 Oklahoma Geological Survey

The Oklahoma Geological Survey is chartered in the State's constitution with the mission of investigating the land, water, mineral, and energy resources of the State, and disseminating the results of those investigations to promote the wise use of Oklahoma's natural resources consistent with sound environmental practices. Programs at the OGS involve fossil fuels, earth science education, geologic mapping, industrial minerals, and earthquakes.

The OGS conducts geologic mapping of the State, including identifying potential hazards such as landslides, rock falls, and sinkholes. The OGS provides data for the mineral mining industry in Oklahoma, which was 32nd in the nation in total non-fuel mineral production value in 2016, accounting for more than 1% of the U.S. total.

The OGS monitors seismicity in Oklahoma using a network of seismometers located throughout the state. This effort began with the Leonard Geophysical Observatory in the 1970s and continues to this day in Norman, OK. Originally comprised of only a few seismic stations, the OGS seismic network has evolved rapidly in the last decade to encompass 100+ seismometers that deliver real-time data to the central data hub in Norman. Analysts in Norman process the seismic data and deliver updated earthquake locations, magnitudes, and other scientific data that are freely-available through the OGS website (http://ogs.ou.edu/).

5.3.21 Oklahoma Department of Human Services

Member of Oklahoma Hazard Mitigation Team

In order to promote the general welfare of the people of the State of Oklahoma, DHS may provide temporary assistance to victims of disasters and emergencies. When a major or lesser disaster is declared in Oklahoma, DHS notifies its Family Support Services Division (FSSD) staff in the declared counties. At that time the FSSD readies its SNAP (Supplemental Nutrition Assistance Program) staff to expedite issuance of food vouchers. Other assistance may be in the form of providing bulk food and diapers to public shelters. DHS is also involved in disaster planning with area aging services to make sure elderly populations are adequately provided for in emergency situations.

5.3.22 Oklahoma Department of Health

Member of Oklahoma Hazard Mitigation Team

The State Department of Health has statutory responsibility for the public health of the people of Oklahoma (63 OS §1- 101). Special Health Services is responsible for food protection service and occupational licensing. Its nine-member State Board of Health is appointed by the Governor and confirmed by the Senate. The Commissioner of Health is appointed by the Board and is responsible for the administration of public health programs in the State.

Public health and medical systems were identified as critical infrastructure and vital support functions in the event of disasters and emergencies. In 2002, the Oklahoma State Department of Health formed the Bioterrorism Preparedness Division, which later evolved to the Emergency Preparedness and Response Service, to address the public health and medical implications of a large-scale disaster affecting the state’s population.

Since that time, the Emergency Preparedness and Response Service has worked diligently with Oklahoma Emergency Management and other federal, state, tribal, local, non-governmental and private partners to ensure the safety of all Oklahomans. In addition, the Emergency Preparedness and Response Service routinely assists neighboring states in times of crisis.

5.3.23 Oklahoma Insurance Department

Member of Oklahoma Hazard Mitigation Team

The elective office of State Insurance Commissioner was created by the Oklahoma Constitution. Duties of the Oklahoma Insurance Department include: approval of the organization of domestic insurance companies of every authorized type; approval of all applications by foreign and alien insurers seeking admission into the State of Oklahoma for the purpose of transacting any insurance business; and approval of certain life, accident, and health insurance policy forms before such contract can be lawfully offered for sale within the State. The Licensing Division oversees the issuance of new and renewal licenses for both resident and non-resident producers, adjusters and business entities.

Additionally, the Oklahoma Insurance Department dispatches CLEET certified police officers from their Antifraud Division to areas of catastrophic damage in order to protect the citizenry from fraudulent activity during a time of crises. The goal of the Oklahoma Insurance Department is to facilitate the speedy economic recovery of Oklahomans from catastrophic events.

The State insurance Commissioner provides counsel to the State Hazard Mitigation Team regarding insurance issues as such pertains to acquisition of repetitive loss properties.

5.3.24 Oklahoma Department of Transportation

Member of Oklahoma Hazard Mitigation Team

The Oklahoma State Department of Transportation, operating under rules, regulations and policies prescribed by the State Transportation Commission, is charged with the planning, construction, operation, maintenance, and coordination of designated multi-modal transportation systems designed to meet present and future transportation needs of the State.

Major areas of activity include the budgeting and accounting for all state and federal funds accruing to the Department; the development and implementation of a Statewide transportation plan; the engineering and acquisition of rights-of way; the award and administration of construction contracts for the improvement of the designated State Highway System and other such transportation facilities as may be applicable under the Statutes; the development and implementation of fiscal and administrative costs; and, the development of administrative rules and guidelines as needed to ensure compliance and compatibility with the objectives of various state and federal transportation programs. ODOT also provides professional assistance to OEM and FEMA regarding repair and replacement of disaster-damaged infrastructure.

5.3.25 Oklahoma Water Resources Board

Member of Oklahoma Hazard Mitigation Team

The OWRB is assigned the statutory responsibility of coordinating the National Flood Insurance Program Statewide, regulating dam safety, administering the water laws of the State, and planning and developing water resources to ensure water supplies are adequate to fulfill the present and future needs of Oklahoma. The OWRB currently coordinates with various local, State, and Federal agencies regarding NFIP activities. Agency manpower is assigned to the following divisions and programs:

Floodplain Management Program - Responds to Oklahoma's frequent flooding incidents by coordinating with other State and Federal agencies and local governments to mitigate the catastrophic effects of these natural disasters. Members of the Division, as well as OWRB Field Office personnel, routinely serve on the State Hazard Mitigation Team. This Team inspects damages, identifies projects potentially eligible for hazard mitigation funding, and prepares recommendations to reduce future losses. The Team coordinates with Oklahoma Department of Emergency Management and FEMA to help provide Federal funds for the mitigation of flood damages to public or private facilities.

National Flood Insurance Program - Mitigates flood disasters through flood damage prevention and the control of development in designated hazard areas.

- Eligible communities must establish a floodplain board, recognize floodplain boundaries and regulate development in those areas. Affordable flood insurance is then available to property owners and renters anywhere in the community.
- Division staff provides guidance to communities in adopting these measures and visits with community officials to assess local floodplain management programs and assist program participants in understanding and implementing effective flood loss reduction techniques. These community assistance visits (CACs) and visits (CAVs) also allow the OWRB an opportunity to point out program deficiencies that need to be addressed to retain eligibility in the NFIP.
- The OWRB's efforts in floodplain management and hazard mitigation include community and public information assistance, and educational services. Primary funding for this program is through the Community Assistance Program administered by FEMA.

Dam Safety Program - An integral part of the Board's role in hazard mitigation relative to ensuring the safety of more than 4,700 non-federal dams 25 feet or more in height and/or impounding 50 acre-feet or more of water. Program staff maintains a current inventory of these dams.

- Many dams, mostly earth fill impoundments, are in need of maintenance or repair. Of particular concern are the structures that could cause loss of life and significant damage to property downstream in the event of failure.
- To check on the safety of these dams, the agency requires and/or conducts regular inspections to verify dam maintenance and integrity. If problems are discovered, the OWRB requires the dam owner or operator to make timely repairs. Agency staff coordinates dam inspection training seminars to ensure that interested private

engineers are qualified to conduct professional examinations of nonfederal dams in the State.

- To confirm that construction is accomplished in a safe and responsible manner, those wishing to construct, enlarge, alter or repair nonfederal dams must first submit an application to the Board, including plans for the proposed modification.

The Financial Assistance Division - Administers loan and grant programs especially for the financing and implementation of sewer and water facilities. The Division makes long-term, low interest loans backed by the Statewide Water Development Revolving Fund. It also makes emergency grants to smaller communities facing infrastructure crises that could threaten life, health or property.

5.3.26 Oklahoma Department of Wildlife Conservation

Member of Oklahoma Hazard Mitigation Team

The mission of the Oklahoma Department of Wildlife Conservation is the management, protection, and enhancement of wildlife resources and habitat for the scientific, educational, recreational, aesthetic, and economic benefits to present and future generations of citizens and visitors to Oklahoma. ODWC does not receive general state tax appropriations. License sales and federal Wildlife and Sportfish Restoration Program grant revenues are the main funding sources. Every license dollar spent by sportsmen in Oklahoma is used to fund ODWC's user pay/public benefit conservation efforts. The Oklahoma Department of Wildlife Conservation (ODWC) with its 350 employees are responsible for managing Oklahoma's fish and wildlife resources and habitat.

The Director’s duties are to manage and control all wildlife refuges and real or personal properties, which are held, operated or maintained by the Department. To appoint and employ all employees of the Department. To approve or disapprove and pay all legal claims for services rendered or expenses incurred by employees of the Department. To establish and maintain a proper system of bookkeeping and accounting under the supervision of the State Auditor and Inspector. To promote and manage wildlife propagation by raising and distributing the same over the state at the direction of the Commission; to capture, propagate, transport, buy, sell or exchange any species of fish, game, furbearing animals and protected birds needed for stocking the lands or waters of the state; and to feed, provide and care for such fish, animals and birds. To make a complaint and cause proceedings to be commenced against any person for violation of any of the laws for the conservation of wildlife in the county in which such proceedings are brought.

The Assistant Director of Operations supervises the fish and wildlife management programs (Fish and Wildlife divisions), Law Enforcement and Information and Education divisions. The Assistant Director aids in executive duties and serves as Acting Director in the Director's absence. The Assistant Director of Administration & Finance supervises Licensing, Accounting, Human Resources, Information Technology, Property, and Communication Personnel. The Assistant Director aids in executive duties and serves as Acting Director in the Director’s absence. The Chief of Information and Education Division oversees education programs,

publications, television and website content. The Chief of Wildlife Division oversees all biologists and technicians on Wildlife Management Areas as well as wildlife research initiatives. The Chief of Fisheries Division oversees four state fish hatcheries, a research laboratory and regional biologists and technicians. The Chief of Law Enforcement Division oversees 117 game wardens stationed in all 77 counties Game Wardens are Oklahoma Peace Officers with arrest powers and are primarily responsible for the enforcement of fish and wildlife laws.

5.3.27 Oklahoma Municipal League

Member of Oklahoma Hazard Mitigation Team

The Oklahoma Municipal League is non-profit organization that serves as the source for information, training, and resources on effective local government for member organizations. The League is recognized as the respected voice of Oklahoma municipal governments in interactions at both the state and national levels. The League provides services and programs to its members to assist them in better serving their citizens and communities and acts as a clearinghouse to offer services which individual cities and towns do not have the time, money, or expertise to provide alone. The League provides guidance to existing and newly elected mayors, and city managers and their staff through workshops, an inquiry assistance service, a weekly newsletter, and legislative bulletins. Additionally, every newly elected municipal official in the State participates in the Leagues New Official's Institute. The League provides an Emergency Response Program whereby the League facilitates training for municipal officials and staff in collaboration with Oklahoma Emergency Management.

5.3.28 State Historic Preservation Office

Member of Oklahoma Hazard Mitigation Team

The State Historic Preservation Office (SHPO) is a division of the Oklahoma Historical Society, a State agency. The SHPO is responsible for administering the Federal historic preservation programs in Oklahoma. The National Historic Preservation Act (NHPA) established these programs and provides the framework for the preservation of the nation's heritage.

Section 106 of the NHPA requires that Federal agencies or their designees must consider the effect of their undertakings on archeological and historic resources listed in or eligible for listing in the National Register of Historic Places. The Advisory Council on Historic Preservation (Council), a Federal agency, has established the regulations (36 CFR Part 800) that govern the Section 106 process and provides guidance to Federal agencies and the SHPO. During disaster recovery efforts, SHPO is an invaluable advisor to FEMA in ensuring that repairs and reconstruction meet all NHPA regulations. Archeological sites, buildings, districts, objects, structures, landscapes, and Traditional Cultural Properties must be identified and evaluated prior to any federally-funded undertakings. The purpose of the Section 106 consultation is to find ways to avoid, minimize, or mitigate any adverse effects on these historic properties. In order to streamline the Section 106 review process, FEMA, SHPO and the Oklahoma Archeological Survey (OAS) entered into a programmatic agreement (PA) in 2015 in order to more effectively and efficiently conduct the review of FEMA undertakings. However, if an undertaking does not qualify as a programmatic allowance under Appendix B of the PA and if an adverse effect finding is made and cannot be avoided or minimized, the Memorandum of Agreement (MOA)

will set forth the mitigation plan (such as documentation of a building or structure that must be demolished, excavation of an archeological site that will be destroyed, etc.).

The SHPO works in cooperation with the Oklahoma Archeological Survey (OAS) to carry out the Section 106 review.

For logistical and budgetary reasons, the SHPO and the Oklahoma Archeological Survey (OAS) operate under a cooperative agreement approved by the National Park Service through which OAS formally participates in the Section 106 process. OAS maintains the site files for Oklahoma's archeological resources and provides professional expertise in prehistoric archeology to the SHPO. Therefore, federal agencies (or their designees/authorized representatives) submit their requests for comments on federal undertakings to both the SHPO and the OAS. OAS reviews projects for possible impacts of ground-disturbing activities on prehistoric archeological resources. Both the SHPO and OAS issue letters to the requesting agency and the language of the letters is coordinated to ensure the agency has documentation of its Section 106 consultation with the SHPO.

5.3.29 Association of County Commissioners of Oklahoma

Member of Oklahoma Hazard Mitigation Team

In Oklahoma, each county has three districts and each district has one commissioner. These county commissioners exercise the administrative powers given to them by the Oklahoma Statutes and the Oklahoma Constitution. Made up of the commissioners from the 77 counties in Oklahoma, ACCO is a non-profit association that provides orientation training and assistance to assist the commissioners in conducting their duties. ACCO's staff provides workshops, written study materials, technical support, and legal advice. Additionally, ACCO:

- Provides information to state lawmakers and officials relating to ACCO's position on a broad array of public policy issues.
- Advocates for legislation useful to counties and oppose bills detrimental to county government operations.
- Opposes unfunded mandates—state or federal initiatives requiring local governments to provide new programs or services with no revenue to support them.
- Provides high quality education and training programs for county commissioners through a variety of meetings throughout the year.
- Creates opportunities for county leaders to exchange ideas, share experiences and take advantage of expert advice.
- Provides a statewide forum for building consensus among commissioners after fully debating issues that affect county government.
- Communicates effectively on the issues and challenges facing counties and how they impact the lives of local citizens and their communities.

5.4 Local and Tribal Capabilities to Address Repetitive Loss Properties and Severe Repetitive Loss Properties (RL5)

The State of Oklahoma Repetitive Loss Strategy has been included as Appendix "B"

5.5 How the State has used its Own Funds for HM Projects Element (S12)

1.) At this time, there is no dedicated State funding for Hazard Mitigation as either direct grants or as a match source.
2.) The Oklahoma Emergency Fund (Title 62. Public Finance, §62-139.42. The State Emergency Fund has primarily been used to fund the following activities;
    a. 12.5% of the Local Match requirement of Public Assistance Category A-H
    b. State Gubernatorial Declarations
    c. Operational costs of EMAC, and OK State National Guard Assistance Requests.
    d. These costs are coordinated through OEM, OMES, State Governors Office and the State Legislature.
3.) State Funding and Appropriations have been made available, primarily for local match requirements for state management costs and FEMA EMPG funding.
4.) OWRB receives State Funding and Appropriations as the required match for the FEMA CAP-SSSE funding, and Dam Safety Program. FEMA RiskMAP funding is Federal and Local match with no State funding provided.
5.) State Agencies may receive State Appropriations as requested to meet various Federal Grant requirements, and these funding levels are fluctuate dependent on those requirements.

5.6 How the State has used FEMA Mitigation Programs and Funding Sources for HM Projects Element (S12)

FEMA is the primary partner in Oklahoma's hazard mitigation planning process, which is the basis for HM Project approval. With the support of FEMA Region VI Technical Assistance, OEM has facilitated FEMA's approval of over 63 local hazard mitigation plans since 2014. During that time, OEM has encouraged the creation of multi-jurisdictional county plans.

As a result of these planning efforts, OEM utilizes many FEMA-sponsored programs related to hazard mitigation, including:

Hazard Mitigation Grant Program (HMGP)

Eligible applicants for FEMA's HMGP funding include: state and local governments, tribes, and certain non-profit organizations. Objectives for project funding include prevention of loss of lives and property due to disasters; implementation of state or local hazard mitigation plans; enabling mitigation measures to be implemented during the immediate recovery of a disaster; and, providing funding for previously identified mitigation measures that benefit the disaster area.

The HMGP is designed to reduce the vulnerability to risk through a coordinated all-hazards approach to mitigation activities, with a heavy emphasis on planning. This focus on planning includes developing and updating local mitigation plans; an analysis of the

risks and vulnerability of each hazard affecting the planning area; implementing the mitigation actions identified in all-hazard mitigation plans; developing state legislation; and adopting local ordinances.

Pre-Disaster Mitigation Grant Program (PDM)

The PDM Program, authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, is designed to assist States, U.S. Territories, Federally-recognized tribes, and local communities in implementing a sustained pre-disaster natural hazard mitigation program. The goal is to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding in future disasters. This program awards planning and project grants and provides opportunities for raising public awareness about reducing future losses before disaster strikes. Mitigation planning is a key process used to break the cycle of disaster damage, reconstruction, and repeated damage. PDM grants are funded annually by Congressional appropriations and are awarded on a nationally competitive basis.

Flood Mitigation Assistance (FMA)

The FMA program is authorized by Section 1366 of the National Flood Insurance Act of 1968, as amended with the goal of reducing or eliminating claims under the NFIP. FMA provides funding to States, Territories, federally-recognized tribes and local communities for projects and planning that reduces or eliminates long-term risk of flood damage to structures insured under the NFIP. FMA funding is also available for management costs. Funding is appropriated by Congress annually.

FMA is a state-administered cost-share program through which states and local communities can receive grants for flood mitigation planning, flood mitigation projects, and technical assistance. Similar to the Hazard Mitigation Grant Program, FMA provides 75% funding assistance to states and communities for flood mitigation planning and activities to fund cost-effective measures that reduce or eliminate the long-term risk of damage to buildings, manufactured homes, and other NFIP-insurable structures, and it is not disaster dependent.

Public Assistance Hazard Mitigation/ Permanent Work (Category C-G)

Hazard mitigation, as defined in FEMA regulations, is "any cost effective measure which will reduce the potential for damage to a facility from a disaster event." Through its administration of the PA Program, FEMA has issued regulations stipulating that Regional Administrators have the authority to require certain hazard mitigation measures in addition to those required by local building codes and standards. The "hazard mitigation criteria required by the President" allowed by law is principally formulated by policy guidance issued by FEMA. This policy guidance explains the conditions by which FEMA will approve assistance for hazard mitigation measures (with examples provided).

In addition to the hazard mitigation measures required and allowed under FEMA's criteria, there are other forms of assistance provided by the PA Program that may have the effect of mitigating future disaster risks. First, there are those costs that are eligible to comply with federal floodplain management standards, namely building code standards related to the National Flood Insurance Program (NFIP) and Executive Order 11988, *Floodplain Management*, as most recently amended by Executive Order 13690, *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*.

C: Roads and Bridges **Note: Category C-G (permanent work) - include regular and overtime labor, equipment, materials and contract costs.*	**Repair of roads, bridges, and associated features, such as shoulders, ditches, culverts, lighting and signs** ****Note if under FHWA authority –Rural Major Collector and above is not eligible under FEMA Public Assistance and may not be included in threshold.***	• **Eligible work includes: repair to surfaces, bases, shoulders, ditches, culverts, low water crossings, and other features, such as guardrails.** ****Road Functional Classification, Rural Major Collector and above (FHWA authority)– Function classification available at following ODOT links***
D: Water Control Facilities	**Repair of irrigation systems, drainage channels, and pumping facilities. Repair of levees, dams, and flood control channels fall under Category D, but the eligibility of these facilities is restricted** **** note if under USACE or NRCS authority(may not be included in threshold)***	• **Channel alignment • Recreation** • **Navigation • Land reclamation** • **Fish and wildlife habitat** • **Interior drainage • Irrigation** • **Erosion prevention • Flood control**
E: Buildings and Equipment	**Repair or replacement of buildings, including their contents and systems; heavy equipment; and vehicles** **** If a facility is insured, note deductible amount when submitting IDA***	• **Buildings, including contents such as furnishings and interior systems such as electrical work** • **Replacement of pre-disaster quantities of consumable supplies and inventory. Replacement of library books and publications.** • **Removal of mud, silt, or other accumulated debris is eligible, along with any cleaning and painting necessary to restore the building.** • **All types of equipment, including vehicles, may be eligible for repair or replacement when damaged as a result of the declared event.**
F: Utilities	**Repair of water treatment and delivery systems; power generation facilities and distribution lines; and sewage collection and treatment facilities**	• **Restoration of damaged utilities.** • **Temporary as well as permanent repair costs can be reimbursed**
G: Parks, Recreational Facilities, and Other Items	**Repair and restoration of parks, playgrounds, pools and public cemeteries. This category also is used for any work or facility that cannot be characterized adequately by Categories A-F**	• **Roads, buildings, and utilities within those areas and other features, such as playground equipment, ball fields, swimming pools, tennis courts, boat docks and ramps, piers, and golf courses.** • **Grass and sod are eligible only when necessary to stabilize slopes and minimize sediment runoff.** • **Repairs to maintained public beaches may be eligible in limited circumstances**

Since 2015, 240 FEMA Public Assistance 406 Mitigation projects have been funded, with over $10.8 Million in funds made available. Predominantly these have been drainage focused such as culvert and roadway mitigation. OEM along with several State Electrical Cooperatives have been awarded re-conductoring mitigation grants, exceeding over $6 Million in funding

5.7 Obstacles in State's HM Policies, Programs, Capabilities, and Funding Sources Element (S12)

In general, the State has been very successful in implementing mitigation projects. OEM averages approximately $6.8 million dollars in federal grant funding each year. There has been an average of 30 disaster-related HMGP projects each year over the past four years (2013-2018). Non-disaster related funds continue to be utilized, with an increase in FMA funding for residential acquisitions in 2017. Available PDM funding has decreased over the years which has resulted in a reduction in potential projects. Funding, or lack thereof, has been a major challenge in implementing mitigation projects in Oklahoma. Oklahoma experiences Presidential disasters frequently and as a result obtains significant Hazard Mitigation Grant Program funds. The fact that Oklahoma regularly experiences disasters presents its own special challenge, as OEM mitigation staff are often involved in response and recovery operations in addition to mitigation program administration.

5.8 Changes in State's HM Policies, Programs, Capabilities, and Funding Sources since 2014 State HM Plan Element (S12)

Within the update period, OEM Hazard Mitigation has experienced staff turnover with the departure of the previous State Hazard Mitigation Officer, and subsequent hiring of a SHMO.

The State NFIP Coordinator duties were assumed by the State Dam Safety Engineer with the departure of the previous State NFIP Coordinator. Several long term members of the State HM staff have departed, requiring significant training and development of staff. OEM continues to invest in new technologies to advance efficiencies, such as an agency wide GIS Online platform, with staff beginning to use and implement GIS analysis for state emergency management operations.

There have been no statutory or regulatory changes that would affect the State's mitigation capabilities.

CHAPTER SIX: LOCAL COORDINATION AND MITIGATION CAPABILITIES

6.1 Summary of Local Policies to Accomplish Hazard Mitigation Element (S13)

The purpose of the local plan is to identify hazards that are specific to those local jurisdiction(s) area, determine a prioritized list of hazard mitigation measures, and implement an action plan for those mitigation actions. For this reason, OEM has a staff of plan reviewers who coordinate plan submissions to FEMA (in compliance with 44 CFR 201.6(d) (1)), and maintain detailed records for tracking, approval, and renewal purposes.

Local governments desiring to develop a hazard mitigation plan currently have two choices: formulate an independent plan, or participate in a multi-jurisdictional planning process. In 2014, OEM adopted the following funding matrix to maximize HMGP Plan funds for local jurisdictions.

Planning Grants are available to municipalities with a population greater than 25,000. Counties

of any population size are eligible for Mitigation Planning funds. OEM encourages all Counties to work with their respective local jurisdictions including local communities and schools to be incorporated into the Planning process. Counties may apply to roll single jurisdictions into the county Plan as time permits.

Hazard Mitigation Planning Grant Funding

Community Type	**Population**	**Maximum Award (Total Project)**
Rural County Multi-Jurisdictional	Less than 25,000/	$50,000
Midsize County Multi-Jurisdictional	25,000-200,000/	$80,000
Midsize City Single-Jurisdictional	25,000-200,000/	$80,000
Urbanized County, **Metropolitan Area**, **Large City, or Regional Plan (multi-county)**	Greater than 200,000/	$200,000

Hazard Mitigation Planning Grants must be based on actual needs of the jurisdiction. Factors affecting the range of costs:

- Technical sophistication of scope of work
- Number and size of participating jurisdictions
- Number of significant hazards affecting Planning area
- Variance of hazards/risk across Planning area
- Update or new Plan (costs of first round updates may be similar to new Plans depending on quality of original Plan; second round updates should start significantly decreasing)
- Post disaster (more to analyze – higher cost)

Both single- and multiple-jurisdiction plans require review and approval every five years. Local plans may also include the incorporated and unincorporated areas within the county. Regardless of the option selected, all participating jurisdictions must meet the requirements of 44 CFR §201.6:

- The risk assessment must assess each jurisdiction's risks where they may vary from the risks facing the entire area. (44 CRF §201.6(c)(2)(iii))
- There must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan. (44 CRF §201.6(c)(3)(iv))
- Each jurisdiction requesting approval of the plan must document that it has been formally adopted. (44 CRF §201.6(c)(5))

6.2 Summary of Local Programs to Accomplish Hazard Mitigation Element (S13)

"The State Hazard Mitigation Plan identifies Oklahoma's hazards, risks, vulnerabilities, goals, objectives, priorities and strategies to enable effective mitigation planning. In addition to working with FEMA in all aspects of hazard mitigation projects and plans, OEM has established partnerships with a variety of agencies for the purpose of exchanging information. This dialog has provided valuable data for the planning and execution of many HM projects throughout the State, as well as those that will be carried out in the future as funding becomes available. This relationship is codified and exercised through the State Hazard Mitigation Team.

Some of these partnerships are ongoing, while others are formed to solicit expert advice on specific projects. Contributors include trade associations such as the **Oklahoma Home Builders Association**, **Oklahoma Portland Cement Association**, and the **Oklahoma Lumbermen's Association**. Academic advisors include Oklahoma Geological Survey which provided input and advice regarding Earthquake Hazard profile. **The University of Oklahoma through the Southern Climate Impact Planning Program** provides current data on climate and meteorological hazard profiles and risk analysis.

The **Oklahoma Water Resource Board** is the State agency that administers the Oklahoma Floodplain Management Act, serves as the State Coordinator for the National Flood Insurance Program [NFIP] and is the lead agency for the FEMA RiskMAP program. The **Oklahoma Insurance Commissioner** is an excellent advocate for flood and earthquake insurance, and the **Oklahoma Conservation Commission** works with OEM on flood buyouts, hazardous material planning, earthquake mitigation and dam safety issues. The **Oklahoma Department of Transportation** [ODOT], the **U.S. Department of Transportation** and the **Federal Highway Administration** [FHWA] work with OEM on flood buyouts, open space restriction, earthquake planning, and bridge retrofits. Additionally, the **U.S. Geological Survey**, the **Central U.S. Earthquake Consortium** [USEC], the **American Institute of Architects** [AIA/OK], the **American Society of Civil Engineers** [ASCE], the **Oklahoma Society of Professional Engineers** [OSPE], Oklahoma Association of Electrical Cooperatives [OAEC], Oklahoma Municipal Power Authority [OMPA], Oklahoma City Foundation, Regional Chamber of Commerce and private businesses support HM initiatives.

The **National Weather Service** [NWS] has enhanced its program offerings, as they are integral tools for hazard mitigation and emergency response. NWS has upgraded its weather radio transmitter system and incorporated enhanced weather radar products to more effectively monitor and deliver hazard information.

Local jurisdictions have established Individual Safe Room registration programs to provide a critical response after a significant weather event. This information has contributed to outreach in areas of communities that have al lower density of safe room installations.

In an effort to better establish the effective warning areas and use of mitigation funds, several jurisdictions have begun to assess their current early warning sirens locations. These jurisdictions have and are developing multi-year plans to invest in modernized warning systems, while retiring those systems that are limited in effectiveness.

6.3 Summary of Local Capabilities to Accomplish Hazard Mitigation Element (S13)

The State of Oklahoma has a strong network of public, and private entities to help further the mission of Hazard Mitigation State wide. The Oklahoma Department of Emergency Management has several working partnerships with various State agencies, and organizations to assist in implementing mitigation measures throughout the State. New relationships with various State agencies and organizations are always being looked into, to help foster various mitigation across the State to become more disaster resilient.

6.4 Challenges to Implementing Local Mitigation Policies, Programs, and Capabilities Element (S13)

- Local Hazard Mitigation Plan upon approval is valid for five years, and in the interim, there is no requirement to document maintenance. In the interim, the local planning team no longer meets, so there is a loss of strategy and knowledge.
- Many jurisdictions reconstitute their local planning teams until just before the local hazard mitigation plan is about to expire, thus starting anew.
- Many jurisdictions lack the understanding on how to integrate mitigation measures into other local plans and initiatives, thus missing opportunities to move mitigation actions forward.
- Local Hazard Mitigation Plan is generally not useful for local, is often found to be cumbersome and unhelpful.
- Local coordination with individual communities is lacking once plan is approved, and hazard mitigation conversation is isolated at a local level.
- State does not generally send reminders to communities letting them know their plan is 18 mos., 12 mos., 6 mos., away from expiration
- Lack of capacity at the local level to update and maintain a local hazard mitigation plan, and at the state level, limited capacity to assist with update.
- Local and state funding priorities have reduced investment on Mitigation resources, with priority shifting to project funding.

6.5 Opportunities for Implementing Mitigation Actions through Local Capabilities Element (S13)

Gaining new partnerships across the State of Oklahoma can greatly benefit further mitigation measures State wide. Technology will continue to improve, and will be able to benefit agencies such as the National Weather Service to alert citizens quickly of various weather hazards. The Oklahoma Water Resources Board (OWRB) has deployed a FEMA FIRM Map and CTP Web viewer to communicate digital and spatial information to the public. City of Tulsa has invested in a Hazard Mitigation viewer that allows public and local officials to view and inform themselves regarding natural hazard effects on the City of Tulsa. OEM is actively developing a Mitigation database and subsequent viewer to allow jurisdiction to view local mitigation actions. As OEM and the State work with various State agencies and organizations, there is also the opportunity to learn about new ways to better further mitigation throughout the State.

6.6 How the State Supports Development/Update of Local FEMA-Approved HM Plans Element (S14)

Training-The State offers a several different options when it comes to training local emergency managers on their hazard mitigation plans. Annually, OEM intends to offer the FEMA 318 class, *Mitigation Planning for Local and Tribal Communities* on how to write their hazard mitigation plan. Additional training opportunities such as the FEMA L-276 BCA Fundamentals course are conducted periodically. OEM routinely encourages local jurisdictions to attend FEMA EMI training courses and opportunities such as HMA Workshop.

New Emergency Managers are required to attend, within 1 year of appointment, OEM New Emergency Manager Orientation, which has a Mitigation component.

Technical Assistance Visits-OEM is very active in engaging local emergency managers in technical assistance visits. These visits range from broad overviews of the hazard mitigation planning process as a whole, or a very detailed visit in walking through their plan section by section. OEM also schedules area technical visits where several counties can come together and the hazard mitigation staff has one on one time with the local emergency managers that need assistance with their plan.

Funding- OEM's ability to provide financial assistance is entirely dependent on the availability of post-disaster funding from FEMA. When the President declares a disaster for the State of Oklahoma and FEMA determines the cost of the disaster, additional funding is provided to the State exclusively for HM efforts. This is referred to as HMGP, or "*404 funding*," as provided under Section 404 of the *Robert T. Stafford Disaster Relief and Emergency Assistance Act.* Approval of the State's 2019 Hazard Mitigation Update will result in Oklahoma's eligibility for FEMA disaster assistance and HMGP funding for *State agencies*, but it does not substitute for the requirement of local governments to have a FEMA-approved plan to be eligible for local hazard mitigation grants.

Local jurisdiction are free to use any funding available to them for this purpose. Local jurisdictions with limited resources are encouraged to consider joining with a larger or even several jurisdictions in the development or update of a multi-jurisdictional plan.

6.7 Summary of Local FEMA-Approved Plans Element (S14)

"The State of Oklahoma has 77 counties and 1922 communities. As of August 2018, the State has 114 local plans approved, which covers 43 counties and four hundred fifty communities. In addition, of the 37 federally-recognized tribes in Oklahoma, seventeen have approved plans. It should be noted that in some jurisdictions, the school system is included in the local plan, but in some instances, the Independent School System may be preparing their Hazard Mitigation Plan separately. After reviewing the above-referenced plans, as well as a number of draft plans submitted for state review, it has been determined that the goals and objectives of these local plans and the goals and objectives of this state plan closely track with one another. Further, the review indicated that based upon information provided by the state, local jurisdictions evaluated hazards and risks in a similar manner and came to similar conclusions as those found within this state plan. One hazard, Sinkholes/Subsidence has been added to the State plan."

6.8-6.9 Barriers and Approach to Developing/Updating, Adopting, and Implementing Local Plans Element (S14)

Within the process of developing or updating, adopting and implementing FEMA-approved local hazard mitigation plans there may be barriers which hinder the local community from moving the process forward. A summary of potential barriers utilizing the STAPLEE framework and a summary of OEM Mitigation Section's approach to addressing and removing these barriers in order to advance local mitigation planning.

- **Social:** Perceived importance and/or community acceptance of mitigation planning
  OEM promotes the requirements and benefits of local mitigation planning through multiple planning workshops across the State, post-disaster coordination activities, publication of mitigation success stories, and posting of outreach materials on the OEM website.

- **Technical:** Lack of resources to develop risk assessments
  In 2018, OEM has proposed through the USACE Silver Jackets program, the development and delivery of a web-application for county wide hazard assessment. This information and web application would allow for local mitigation planners who are performing all the needed local Risk Assessments by providing default data developed for the State Plan to be accessed online.

- **Administrative:** Lack of personnel to prepare the plan
  OEM provides the local planning community with training workshops; planning "toolbox" with meeting materials; a plan development outline with instructions; and a full-time Lead Planner to answer questions, provide instruction, and review plan documents. OEM does not provide personnel to directly prepare plans, numerous planning materials and technical assistance is provided to streamline the planning process for the local community.

- **Political:** Lack of local champion to lead planning process, and local buy in of mitigation actions.

- **Legal:** Requirement for Mitigation Planning

  Legal precedence for local mitigation planning is addressed in the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended by the Disaster Mitigation Act of 2000, requiring local governments to develop and adopt FEMA-approved hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance.

- **Economic:** Lack of available funding

  There are two primary sources of funds available to help local jurisdictions develop and update hazard mitigation plans, FEMA's HMGP and PDM. OEM provides information on all FEMA HMA grant programs, including eligibility, application needs, and deadlines on their website:
  https://www.ok.gov/OEM/Programs_&_Services/Mitigation/index.html
  OEM encourages local governments to apply for FEMA planning grants, as well as, to participate in multi-jurisdictional plans to share the financial burden.
- **Environment**

  Although not required for local mitigation plans, with the 2018 State Plan update OEM has addressed changing future conditions, including the effects of long-term changes in weather patterns and climate on the identified hazards. As local mitigation plans consider inclusion of changing future conditions in their update processes, SEMA and the information provided within the State Plan update will support this effort.

6.10 The Criteria for Prioritizing Funding Element (S15)

Federal Disaster funds are contingent upon availability. Further, jurisdictions are competing with each other for access to the same funding. OEM may prioritize funding requests based on whether the requesting jurisdiction has demonstrated the desire and ability to complete the project; however, this desire to comply with the initiatives in the local mitigation plan should not be dependent on the availability of State or Federal funds.

Oklahoma's local governments may apply for hazard mitigation grants through the on-line grants portal, OEMGrants (accessible through the OEM website) OEM's Hazard Mitigation staff by direction of the SHMO then reviews the applications for completeness. In an effort to provide equitable distribution of mitigation funding, the following general guidelines were developed by OEM for the evaluation of local mitigation projects:

1. The jurisdiction must have a FEMA-approved Hazard Mitigation Plan, and the proposed project must be identified as an "*Action Item*" within the plan.
2. The jurisdiction must have the ability to provide the non-federal cost share.
3. OEM will consider the Benefit Cost Analysis [BCA] for each project, with projects with the most favorable BCA receiving the highest priority.
4. OEM may consider past experience in dealing with the applicant on other grants (such as disaster grants, mitigation projects, etc.).
5. OEM may contact other State and federal agencies as well as councils of government, to inquire as to past experiences with the applicant.

6. OEM may review the applicant's susceptibility to the natural or man-made hazard the project seeks to address. Consideration will be given to communities with the highest risk.
7. OEM may review previous presidential disaster declarations, as well as non-declared events, to determine the number of times the applicant has been impacted by the events and the magnitude of damages resulting from the events. This review would consider the impact on infrastructure, as well as human suffering.
8. OEM will consider whether the applicant participates in the National Flood Insurance Program.
9. OEM will consider the number of insured, repetitive loss structures within the applicant's jurisdiction.
10. OEM may consider the applicant's status as a small or impoverished community.
11. OEM may consider if the applicant has demonstrated ability to form effective disaster response and recovery partnerships.
12. OEM may offer special consideration to jurisdictions experiencing extreme growth.

Grant applications that meet these considerations, as determined by the SHMO, are then forwarded to FEMA region VI for approval.

Administration of the Pre-Disaster Mitigation (PDM) Program

OEM will administer the Pre-Disaster Mitigation Program based on the requirements and guidelines established by FEMA under the Disaster Mitigation Act of 2000. The Mitigation Division will have the primary responsibility for implementing this program within the State. All jurisdictions are potential candidates for the pre-disaster mitigation program. Ideally, all communities would participate in some form of pre-disaster mitigation; however, due to differences in local capabilities and priorities, the degree of participation will vary greatly from community to community.

The pre-disaster mitigation program is designed to provide technical and financial assistance to State and local governments to assist in the implementation of pre-disaster hazard mitigation measures that are:

1. Cost-effective;

2. Designed to solve a problem to reduce injuries, loss of life, and damage or destruction of property (including damage to critical State or local government services and facilities); and

3. Complement current State and local mitigation goals and objectives. Technical assistance will be primarily through the use of personnel from Oklahoma Emergency Management Agency (OEM) Mitigation division and funding assistance will be based on the availability of funds through the programs administered.

Financial assistance under PDM is provided with a Federal cost share of up to 75% of the total cost of approved mitigation activities. Funds provided to communities shall be used

principally to implement cost-effective pre-disaster mitigation measures.

They may also be used to:

- Support effective public-private natural disaster hazard mitigation partnerships;
- Improve the assessment of a community's vulnerability to natural hazards; or
- Establish hazard mitigation priorities, and an appropriate hazard mitigation plan, for a community.

HMGP Funding

The State will use the criteria mentioned above to assist in determining which communities should receive technical and financial assistance under this program. In addition to those criteria, listed above the State **will also** consider the basic Criteria for Assistance Awards established in the Disaster Mitigation Act of 2000. Those criteria are as follows:

1. The jurisdiction must have a FEMA approved Hazard Mitigation Plan.
2. The extent and nature of the hazards to be mitigated.
3. The degree of commitment of the local government to reduce damages from future natural disasters.
4. The degree of commitment of the local government to support the hazard mitigation measures to be carried out using the technical and financial assistance.
5. The extent to which the hazard mitigation measures to be carried out using the technical and financial assistance contribute to established State/Local mitigation goals and priorities;
6. The extent to which prioritized, cost-effective mitigation activities that produce meaningful and definable outcomes are clearly identified,
7. If the local government has submitted a mitigation plan, the extent to which the activities identified under paragraph (5) above is consistent with the mitigation plan,
8. The opportunity to fund activities that maximize net benefits to society, and
9. The extent to which assistance will fund activities in small impoverished communities.

Small and Impoverished Community Provisions

Small and impoverished communities means a community of 3,000 or fewer individuals that is identified by the State as a rural community, and is not a remote area within the corporate boundaries of a larger city; is economically disadvantaged, by having an average per capita annual income of residents not exceeding 80 percent of national, per capita income, based on best available data; the local unemployment rate exceeds by one percentage point or more, the most recently reported, average yearly national unemployment rate; and any other factors identified in the State Plan in which the community is located.

OEM has received assistance from the Oklahoma Department of Commerce in determining those communities that meet the criteria. These communities appear to meet the intent of the Disaster Mitigation Act of 2000's definition of small and impoverished.

The President may increase the Federal cost share to 90% of the total cost of mitigation activities carried out by small impoverished communities. For non-planning grants, the FEMA funding programs and the State require that projects be cost effective and consideration of the extent to which benefits are maximized is one of the criteria that must be met.

6.11 The Criteria for Prioritizing Funding for Repetitive Loss Properties and Severe Repetitive Loss Properties (RL6)

The State of Oklahoma Repetitive Loss Strategy has been included as Appendix "B"

6.12 The Process and Timeframe Review, Coordinate, and "Link" Local HM Plans with the State HM Plan Element (S16)

Local / State Plan Integration

"The Oklahoma Emergency Management, Mitigation Division will play a key role relative to general oversight, reviewing goals and objectives, and developing a Pre-Disaster Mitigation implementation planning strategy. After reviewing approved plans as well as multiple drafts that were submitted for State approval, the State Hazard Mitigation Planning Team determined which goals and objectives of the local plans most closely tracked with the State goals and incorporated them into the State plan. This review also indicated that hazards and risks were evaluated in a similar manner and supported the findings found within this State plan. FEMA approved plans are reviewed within 30 days of approval and stored in the State of Oklahoma Plan Data Base where they are linked and coordinated with the State of Oklahoma Hazard Mitigation Plan.

The State Hazard Mitigation Planning Team has reviewed each risk assessments and mitigation strategies of approved local plans when preparing this edition of the State plan. Information in local plans that supplements and improves the accuracy and depth of the State plan have been added to the plan.

Such information may include, but not be limited to:

Locations of hazard areas identified by the local jurisdiction

Information on populations and structures located in or near local hazard/critical areas

Information on projected growth in or near identified hazard/critical areas.

Identify mitigation goals and strategies that require State attention through inclusion in the State plan

Consideration will be given to communities with the highest risks, repetitive loss properties, and most intense development pressures. For non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a Benefit Cost Analysis of proposed projects and their associated costs.

Historically, information contained in this *State Hazard Mitigation Plan* has been, and will continue to be, integrated into the planning documents of other state agencies, local governments, universities, businesses, and private associations. OEM invites all interested entities to freely use information provided in the State Plan in the development and management of their mitigation plans and programs. The *Oklahoma Hazard Mitigation Plan* is accessible through the OEM website.

OEM's Plan Review Procedure

Local plans submitted to OEM for review are evaluated on a first come, first served basis. Each plan is received at the State Recovery Office where it is date stamped and forwarded to the OEM's Hazard Mitigation Division which maintains a comprehensive log of the local plans which includes the sponsoring applicant, the sponsoring agent (e.g., contractor, planner, COG), the plan's participating jurisdictions, the date the plan was received, and the dates of internal review. This log also includes the date the plan was provided to FEMA, its disposition following FEMA review, and the current status of the plan.

OEM's internal reviews take approximately 30-60 days from the date the reviewer begins the evaluation. OEM's review staff may suggest corrections or request additional information before the plan is transmitted to FEMA. If the plan is determined to be deficient, OEM provides an in-depth critique and remediation instructions. Depending upon the extent and scope of the remediation effort, the applicant is allowed one to two weeks to make the corrections and resubmit the plan. OEM's plan review objective is to have the plan acceptable to pass the State review and forwarded on to Region VI within 45 days of the original receipt of the plan. The following is the current process used by OEM to review both new and updated plans:

1. Draft of plan is submitted to OEM for review.
2. OEM's Plan Review Staff performs an internal review of the plan.
3. After all required revisions are completed, OEM transmits plan to FEMA Region VI.
4. FEMA approves plan and notifies OEM of its approval, pending adoption of the plan by the participating jurisdictions.

5. OEM notifies the sponsoring agent of pending approval.

5. The participating jurisdictions adopt the plan and send the resolutions to OEM.
6. The sponsoring agent provides two copies of the plan, and two CDs of the same, to OEM.
7. OEM retains one copy of the plan and CD, and submits the other copy of the plan and CD to FEMA Region VI.
8. FEMA grants approval of the plan and sends a notification letter with the approval date, to OEM.
9. OEM notifies each participating jurisdiction, via certified mail, of the plan's approval.
10. Each Plan Update must be approved no later than five years after the initial approval date.

CHAPTER SEVEN: PLAN REVIEW, EVALAUTION, AND IMPLEMENTATION

7.1 The Method and Schedule for Monitoring, Evaluating, and Updating the Plan Element (S17)

Chapter Seven describes the formal process that will ensure that the State Hazard Mitigation Plan remains an active and relevant document available for reference and guidance to the public in mitigating the risks associated with natural hazards. The plan maintenance process includes

annual evaluations, revisions and updates as required. The Plan will be resubmitted for FEMA review every five years.

- Proposed changes will be included in the agenda for regularly-scheduled quarterly meetings of the State Hazard Mitigation Team (SHMT) to be discussed by the team.

- If the State Hazard Mitigation Officer (SHMO) determines the need for changes to be urgent, the SHMO can schedule a special session of the SHMT. Proposed legislative measures or changes in FEMA policies would be examples of exigent circumstances.

Plan Monitoring

OEM's Hazard Mitigation staff will be responsible for monitoring the Plan on a quarterly basis and as disaster events occur. While each chapter of the Plan will be monitored for possible update requirements, Chapters Three (Risk Assessment) and Four (Goals and Objectives) will receive the closest attention due to the frequency of changes to "Previous Occurrences" and processing of "Action Items."

OEM's plan review staff will respond to the State Hazard Mitigation Team's (SHMT) status requests regarding the Plan in the Team's quarterly meetings. Copies of the State Plan will be provided upon request and the Plan will be available on the OEM website (http://www.oem.ok.gov).

Plan Evaluating

OEM's Hazard Mitigation staff will be responsible for evaluating the Plan. The planning team will continuously evaluate the State Hazard Mitigation Plan to determine the effectiveness of the Plan's processes.

Plan evaluation will address the following:

- Chapter One – "About the Plan":
  Are there any changes in Scope, Funding, and or Strategy?

  Are there any changes in the State's demographics & growth trends?

  - Maintain contact with local jurisdictions concerning major changes in populations or development.

- Chapter Two – "Planning Process":
  Are the existing Plans / Programs still relevant to the maintenance and upkeep of the Plan?

  - Determine if there were any implementation problems, such as technical, political, legal, or coordination issued with other agencies.
  - Are contact lists being maintained to the responsible agency heads and resources?
  - Evaluate how other agencies and partners have participated.

- Chapter Three – "Risk Assessment"
  Are there any changes or updates required in the hazard risk assessment?
  - Evaluate magnitude of risk and determine if it has changed.
  - Incorporate New or revised Risk data as provided by those relevant data agencies

- Chapter Four – "Goals and Objectives"
  Are there any changes in the Goals and Objectives of the Plan?
  - Following a disaster in the state, whether declared or not, large or small, OEM's Hazard Mitigation staff will review the events in that disaster to evaluate their impact upon the Plan's Goals and Objectives.
  - Evaluate the Mitigation Action Items per the process outlined in Chapter Four.

- Chapter Five – "Coordination of Local Mitigation Planning"
  Are there any changes in Coordination processes with Sub-Grantees and other State Partners?
  - Maintain close contact with local jurisdictions regarding the status of their plans and mitigation projects.
  - Have changes in Plan development requirements been communicated to the Sub-Grantees by OEM's Hazard Mitigation staff?

- Chapter Six – "Plan Maintenance Process"
  Are there any changes to the Plan Maintenance Process that will enhance or improve its effectiveness?
  - The State Hazard Mitigation Officer will evaluate the Plan Maintenance Process during each Update cycle.
  - Other changes as required by the State Hazard Mitigation Officer, the State Hazard Mitigation Team, and Federal/State Statutory Regulation Updates

Following evaluation review, the OEM's plan review staff will recommend updates and changes to the Plan.

Plan Updating

OEM's plan review staff, along with the SHMT, will be responsible for updating the Plan. The Plan will continue to be evaluated and updated annually during the five-year cycle process and any time there is a disaster. Beginning the fourth year, OEM's staff will review all revisions to be finalized based on review of the evaluation data received and sent to FEMA six months before the end of the fifth year in order for the State of Oklahoma to maintain eligibility for federal disaster assistance programs. The Plan will be resubmitted for FEMA review every five years.

Plan Maintenance Process Effectiveness

Analyses by OEM Management of the Monitor, Evaluate and Update section of this plan revealed that these methods, schedules and processes are proper, effective and will continue to be appropriate for use in the future.

7.2 The System for Tracking all Mitigation Action Items and Plan Goals Element (S18)

A. In order for any program to remain effective, the goals and objectives of that program must be reviewed and tracked periodically. The State Hazard Mitigation Officer is responsible for this review and tracking on an ongoing basis. That review and tracking process should address, as a minimum, the following issues:

1. Are the established goals and objectives realistic? Review will take into consideration available funding, staffing, and State/local capabilities, and the overall State mitigation strategy.
2. Has the State clearly explained the overall mitigation strategy to local governments?
3. Are proposed mitigation projects evaluated based on how they help the State and/or local government meet their overall mitigation goals and objectives?

4. How have approved mitigation projects complemented existing State and/or local government mitigation goals and objectives?
5. Have completed mitigation projects generated the anticipated cost avoidance or other disaster reduction result?

A thorough and realistic evaluation of the benefits of a mitigation project may be delayed until the area of the project is impacted by another disaster. The lack of realized benefits from a completed mitigation project may result in the disapproval or modification of similar projects in the future. At the same time, mitigation projects that have proven their worth may be repeated in other areas of the State.

Based on the results of the review/evaluation mentioned above, the State may need to adjust its goals and objectives to meet the current and future mitigation needs of the State and local governments. A formal mitigation status report, if requested or required, will be prepared by the SHMO on an annual basis. This report will be provided to the Oklahoma Emergency Management Director and Deputy Director for review and distribution, as needed. The report will address, as a minimum, the following items:

1. Completed mitigation projects
    a. Affected jurisdiction
    b. Brief description of the project
    c. Source of funding
    d. Brief summary of any problem areas, with proposed solution
    e. Brief summary of effectiveness (cost-avoidance) of project, if available
2. Mitigation projects in progress
    f. Affected jurisdiction

g. Brief description of the project
h. Source of funding
i. Brief summary of project status
j. Anticipated completion date

3. Pending (under review) mitigation projects
    k. Affected jurisdiction
    l. Brief description of the project
    m. Source of funding
    n. Brief summary of project status

Oklahoma Emergency Management has reviewed the mitigation actions and determined that they were implemented as planned when funds and personnel allowed. The action items were reviewed and it was determined that each project contributed to meeting the States Goals and Objectives.

B. Monitoring Progress of Mitigation Activities

OEM is responsible for the monitoring and tracking of the progress of mitigation actions. The SHMO has been assigned to monitor and track the progress of mitigation measures by following-up with other agencies. In addition to the SHMO, the SHMT has been identified in the planning process section as the committee who will monitor the progress of state mitigation actions and will meet on a quarterly basis for the review.

OEM mitigation staff tracks progress through quarterly reports from sub-grantees, and at the end of each quarter, a progress report is submitted to FEMA listing each project.

Once a year the SHMT will meet to report on the overall progress on achieving the Plan's goals, review any new information and make recommendations to the SHMO for updating the baseline data used in the risk analysis. This information is used to reassess project prioritization, as necessary.

• Project outcomes (successes/difficulties/what could have been done better) using the last Quarterly Report as the final evaluation;

• Relevance of goals to changing situations;

• New information learned from disasters, studies or reports;

• Changes in State or federal policy;

• Risk assessment updates; and

• Level of coordination among agencies in the State

Goals, objectives and projects will be reviewed in the event of a disaster to determine whether they need to be modified to reflect the new conditions and the findings appended to the existing Plan. Based on the current conditions, the goals and projects will be reevaluated to determine if there is a need to modify the Plan. If necessary, the SHMO will update the Plan based on the recommendations of the SHMT. Each action will be reviewed by members of the planning committee, and updates such as contacts, prioritization, and fund names will be updated.

FEMA requires that all disasters be closed and project activity terminated within five years of a disaster declaration. The SHMO will ensure that all grant projects are closed after all approved work has been completed or within two years of the date of project approval, whichever comes first. The SHMO will monitor all project files and fiscal issues and perform an annual site visit to ensure the community's compliance. The Project Manager is responsible for notifying the SHMO within 10 days of completion of the project. The SHMO will schedule a final site visit to review all program and fiscal records related to the project, and all unspent funds being held by the community must be returned.

A programmatic and fiscal closeout ensures that all claims and costs are eligible and in compliance with the Project Application and program requirements. At the time of the closeout, all files not previously reviewed or completed will be reviewed to ensure all necessary documents are included. If a file does not contain all required documentation, the Project Manager will be required to provide the information within 30 days of closeout. When all files are complete, the SHMO prepares a spreadsheet providing the total project costs and appropriate cost shares. IEMA and community will comply with the Single Audit Act, as amended, and maintain all project documentation for a period of three years following project or disaster closeouts.

The State mitigation staff will monitor, review and evaluate the deadlines for each project and assess the status of the goals and activities throughout the year. Any recommendations regarding actions necessary to ensure a project's completion will be reported to the SHMO. The SHMO in coordination with the INHMPC and MCSC are responsible for monitoring and updating the plan.

OEM is currently developing separate Mitigation Planning and Grant Management tool boxes. These "toolboxes" provides templates and examples for developing successful applications for HMGP grant funds and planning documents, as well as examples of budgets, budget narratives, scope of work, cost match letters and procurement documentation.

OEM HM will continue to solicit counties to update their hazard mitigation plan. There are many mitigation actions that can be completed by local jurisdictions with little to no funding required from the State or Federal governments, larger projects, which historically have the biggest impact on reducing the risks, are still required to maintain interest in mitigation planning. The State mitigation staff coordinates the review of these plans in the form of technical assistance and direct review before the plan is officially submitted to FEMA.

CHAPTER EIGHT: ADOPTION AND ASSURANCES

8.1 Adoption Resolutions Element (S19)

MICHELANN OOTEN
STATE DIRECTOR

STATE OF OKLAHOMA
DEPARTMENT OF EMERGENCY MANAGEMENT

HAZARD MITIGATION PLAN ADOPTION

The 2019 State Of Oklahoma Standard Hazard Mitigation Plan is hereby adopted.

The State of Oklahoma will continue to comply with all applicable federal laws and statutes during the periods for which it receives grant funding, in compliance with 44 CFR §13.11(c), and will amend this plan whenever necessary to reflect changes in state or federal law and statutes in 44 CFR §13.11(d)

The State will also continue to pursue Enhanced State Hazard Mitigation Plan status in compliance with 44 CFR §201.5 to continue the State's dedication to risk reduction and resiliency for the citizens of the State of Oklahoma.

Michelann Ooten

Michelann Ooten, Director
Oklahoma Department of Emergency Management
Governor's Authorized Representative

1-23-19
Date

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8.2 State Assurances Element (S20)

Purpose

This plan is prepared to comply with the requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (as amended by the DMA); all pertinent presidential directives associated with the U.S. Department of Homeland Security and FEMA; all aspects of 44 CFR pertaining to hazard mitigation planning and grants pertaining to the mitigation of adverse effects of disasters (natural, manmade, and other); interim final rules and final rules pertaining to hazard mitigation planning and grants, as described above; all planning criteria issued by FEMA; and all Office of Management and Budget circulars and other federal government documents, guidelines, and rules.

The State of Oklahoma agrees to comply with all federal statutes and regulations in effect with respect to mitigation grants it receives, in compliance with 2 CFR parts 200 and 3002. The State of Oklahoma Standard Hazard Mitigation Plan will be updated every five years or as required and amendments will be made as necessary to address changes in federal or state statutes, regulations, and policies. Such amendments will be submitted to FEMA for approval. Additional information about how the plan will be reviewed and updated is in Section 7.

OEM intends to comply with all administrative requirements outlined in 2 CFR parts 200 and 3002 in their entirety and to monitor all Sub-recipients supported activities to ensure compliance with 2 CFR parts 200 and 3002 in their entirety.

OEM also requires all Sub-recipients receiving $750,000 or more in federal assistance to have an audit conducted in accordance with the Single Audit Act under 44 CFR 14, Administration of Grants: Audits of State and Local Governments. Such reports by an independent certified public accountant will be maintained by OEM. All general audit requirements in 44 CFR 14 will be adhered to by OEM as well as Sub-recipients receiving FEMA hazard mitigation grant awards.

General

Section 404 of the Stafford Act establishes an independent Hazard Mitigation Grant Program that provides a source of funding for mitigation projects that are cost-effective and are identified in the community's hazard mitigation Plan. The program is aimed at mitigating hazards that have repeatedly caused damage in the past, and to mitigate those hazards that may affect the State of Oklahoma in the future.

Authorities and References

The authorities and references for this Hazard Mitigation Plan are found in the following citations:

Federal Laws

- Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288)
- Sandy Recovery Improvement Act of 2013 (P.L. 113-2)
- Single Audit Act of 1984 (PL 98-502)
- 2 CFR, Part 200: "Super Circular" Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards
- 44 CFR, Part 9: Floodplain Management and Protection of Wetlands
- 44 CFR, Part 10: Environmental Considerations
- 44 CFR, Part 80: Property Acquisition and Relocation

- 44 CFR, Part 201: Mitigation Planning
- 44 CFR, Part 206: Subpart N Hazard Mitigation Grant Program
- 44 CFR, Part 207: Management Costs
- Public Law 106-390, Disaster Mitigation Act of 2000 (Amendment to Robert T. Stafford Disaster
- Relief and Emergency Assistance Act
- The National Security Act of 1947
- Public Law 84-99 (33 USC 701n) for flood emergencies
- Public Law 85-256, Price-Anderson Act
- Public Law 89-665 (16 USC 470 et seq.), National Historic Preservation Act
- Public Law 90-448, National Flood Insurance Act of 1968 (42 USC 4001 et seq.)
- Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970
- (42 U.S.C. 4601 et seq.)
- Public Law 93-288, as amended by Public Law 100-707, The Robert T. Stafford Disaster Relief and
- Emergency Assistance Act (42 U.S.C. 6121 et seq.)
- Public Law 93-234, Flood Disaster Protection Act of 1973
- Public Law 95-124, as amended by Public Laws 96-472 and 99-105, Earthquake Hazards Reduction
- Act of 1977 (42 USC 7701 and 7704)
- Public Law 96-295, The Nuclear Regulatory Commission Appropriations Authorization Act
- Public Law 96-510, Comprehensive Environmental Response, Compensation, and Liability Act of
- 1980, Section 104(i),(42 USC 9604(i))
- Public Law 99-499, Superfund Amendments and Reauthorization Act of 1986
- Public Law 101-615, Hazardous Materials Transportation Uniform Safety Act
- Public Law 101-549, Clean Air Amendments of 1990
- Public Law 107-296, Homeland Security Act of 2002
- *As amended where applicable

Office of Management and Budget (OMB) Circulars

OMB Circular A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs

Executive Orders

- Executive Order 11988, Floodplain Management
- Executive Order 11990, Protection of Wetlands
- Executive Order 12656, Assignment of Emergency Preparedness Responsibilities
- Executive Order 12148, Federal Emergency Management
- Executive Order 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction

- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- Homeland Security Presidential Directive 5, Management of Domestic Incidents, February 28, 2003
- Homeland Security Presidential Directive 8, National Preparedness, December 17, 2003
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State Laws

- Constitution of the State of Oklahoma, as amended
- Oklahoma Civil Defense and Emergency Resources Management Act of 1967, as amended 1984.
- Title 63 O.S. 2001, Section 683 Oklahoma Emergency Management Act of 2003, as amended.
- Title 82 O.S.2001, §. 1601-1618, as amended, "The Oklahoma. Floodplain Management Act".
- This Plan is referenced in the State of Oklahoma's Emergency Operations Plan, contained in a separate document on file at the State EOC.

Emergency Management Accreditation Program, 2018

- 4.1 Hazard Identification, Risk Assessment and Consequence Analysis
- 4.2 Hazard Mitigation Standards